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The Arboretum Bulletin

VOLUME XV

FALL, 1952

NUMBER 3

Summer in the Arboretum

B. O. MULLIGAN

THIS season can be briefly characterized as being, through late June and early July, a time of flowering of many beautiful and useful trees and shrubs for garden adornment; the varied *Cistus*, the later magnolias, azaleas and rhododendrons, old-fashioned types as well as species of roses, more noticeable in bloom now that they have attained some size, *Genista* species, the Japanese dogwood, *Cornus Kousa*, the several hydrangeas and lilies around the head of Rhododendron Glen, providing color and fragrance through mid-summer. In late July and August there is much less to obviously attract the visitor, but Hydrangeas continue and are most useful following the rhododendrons, while the golden flowered hypericums across the Upper Road from the camellias bloom now, as do the various heathers on the rock garden near the cottage, fuchsias in the lath house, and some unusual plants in the borders around the greenhouses and offices.

The Arboretum staff, however, has little time to appreciate these pleasures, except incidentally and in passing. For them it is a period of continuous maintenance work for many weeks—weeding, watering and mowing in particular—and as most vacations are also taken at this time there is frequently a lack of manpower to do even essential jobs at the right date. Nevertheless a great deal has been achieved to keep the Arboretum and its plant collections in fair condition, and the following

are amongst some recent accomplishments.

In the yard the new shrub beds near the offices have been first surrounded by an edging of cut and fitted logs and afterwards mulched with wood chippings; most of the plants are growing well. The dam forming the upper pool in Woodland Garden has been repaired and other smaller pools formed at intervals lower down the stream.

Sulphate of ammonia was applied to all the beds of camellias, azaleas, rhododendrons, hollies and other plants which are heavily mulched, in order to keep them growing satisfactorily; the summer watering washes this down to the roots of the plants. A steady campaign has been continued to eliminate the creeping or canadian thistle from cultivated beds, by spot treatment with the weed killer 2-4-5 T, with considerable effect. If we could find an equally efficient method of dealing with horsetail in Rhododendron Glen our major weeding problems would be almost solved. At present a small crew covers the ground systematically wherever plantings have been made; Woodland Garden has been dealt with separately by another man (Mr. L. P. Rogers), for whom the sponsoring West Seattle Garden Club has been financially responsible, to the extent of some 200 hours of work.

The mowing problem has been distinctly helped by the acquisition in late June of a 24-inch Mott type of mower, similar in principle to our larger tractor model, but able to operate

on banks, close up to plants and in narrow places where previously the scythe or a sickle had been the most practical tool. This is an excellent example of suitable mechanical equipment to help our small labor force in the struggle against grass and weeds each summer.

Two new and larger gateposts have been erected, one at each end of the Upper Road; other damaged property to be replaced has been four of the wooden plugs used to prevent automobiles from driving off the Boulevard on to Azalea Way and elsewhere.

Many of the beds in the lath house south of the greenhouses have had fresh soil brought in, before replanting with young azaleas and other plants which have evidently appreciated it, while along the south side a protective screen of lath frames, each 8 by 6 feet, has been constructed and hung. This will not only reduce the sunshine reaching these young plants in summer, but also the damage to evergreens from the same source in the winter, when a bright clear morning follows a frosty night. This particular lath house was constructed without sidewalls, and the need for this protection has been obvious. In the nursery 468 young plants of 45 distinct genera were set out in June, and at the same time older plants still remaining were pruned. The ridges and sash bars of the two greenhouses have been puttied where necessary and repainted. The identity of all *Cistus* in the collection has been checked, the names corrected in a few instances and relabeled; about half of the *Rosa* and *Malus* collections have been similarly treated.

Plantings

Late spring and early summer planting was small in quantity and variety, and chiefly comprised young plants in pots. These included four species of *Ceanothus* (11 plants), five of *Hebe* (20 plants), *Cytisus*, both species and hybrids (21 plants), and five kinds of heathers totaling 70 plants. In addition the circular bed in front of the Historical Society Museum was planted with two trees of Japanese apricots (*Prunus Mume*) and several large rhododendrons.

Aquisitions

(a) *Plants and Seeds*

A collection of various shrubs including *Abelia*, *Buxus*, and *Deutzia* was received from the U. S. Department of Agriculture, Beltsville, Maryland, 100 rooted cuttings of the heather "H. E. Beale" from Malmo Nurseries, Seattle, and a magnolia plant purchased in memory of the late Mr. E. L. Skeel with funds received from Lake Washington Garden Club, Unit 3.

Seed collections have come to us from the National Botanic Gardens, Kirstenbosch, South Africa, the Botanic Garden, Gothenburg, Sweden, and the Lloyd Botanic Garden, Darjeeling, India; Mrs. P. MacBride of Woodinville, Washington, shared a very interesting collection of native New Zealand seeds with us, and from another private source in that country we received a welcome supply of three species of *Nothofagus*, southern Beeches, none of which are at present growing here.

(b) *Books*

Few have been added during the summer; the more important are: Sweet's "British Flower Garden," Series 2, Volume III (1835), a gift from Woodway Park, Unit 22; "Effective Flowering Shrubs," by M. Haworth-Booth (1951); the "Azalea Handbook" of the American Horticultural Society (1952); "Lily Yearbook" of the North American Lily Society (1952); and "Nuttall's Travels in the Old Northwest," by Dr. Jeannette Graustein (1951).

(c) *Equipment*

The 24-inch Mott hammer knife mower, already mentioned, with a 6-h.p. motor, two forward and a reversing gear, cost \$471.23 including state tax. The only other item of note was a heavy steel box, about 26 by 40 by 30 inches, standing (open side down) in a raised tray of similar material containing water which can be heated from below; this is for the purpose of partially sterilizing by steam a number of flats of soil at one time, and was constructed for us by the sheet metal shop of the University.

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The Brooklyn Botanic Garden

GEORGE S. AVERY, JR.*

WHEN asked about the best season to visit the Garden, one of our good friends replied, "When it is warm enough to hear the busy hum of a bee and something inside tells you, 'Don't run, walk'—then is the time to visit the Botanic Garden." And he was about right. The great display of double-flowered Oriental cherries and the flowering crab apples are usually at peak bloom during the first week in May; preceding this magnificent spectacle by about two weeks are the showy magnolias. These are the only two groups of flowering trees planted for mass effect, but there are numerous other kinds that provide bloom during eleven of the twelve months of the year. Visitors to New York City who are familiar with the famous flowering cherries in Washington as well as those in the Botanic Garden collection tell us that the latter are just as lovely. Comparison is difficult, because the displays are so different; both are magnificent. For a never-to-be-forgotten experience, visit the Botanic Garden in Cherry Blossom time.

Of the many "Gardens Within a Garden," five are outstanding; the Osborne Memorial for its formal display of Azaleas, the Cranford Rose Garden, the White Memorial Japanese Garden, the Water Lily Pools and accompanying Perennial Garden, and the Wild Garden—where wild flowers and native trees are a living lesson in conservation. Most of the other gardens are intended to be simple in design and scope, so that visitors may get ideas for home plantings. Among these are the Rock, Herb and Iris Gardens, the last named being the recent gift of an especially generous and interested Garden Club.

In addition to the many formal and informal gardens, the overall plan includes an Arboretum; in this huge collection of woody plants are specimens of the outstanding varieties of ornamental trees and shrubs of the world. The

special greenhouse collections include cacti and other succulents of the African and American deserts, ferns of the world, palms and cycads, and economic plants of the tropics.

This, in brief, describes what is to be seen at the Brooklyn Botanic Garden—along the two miles of main walks, in the special gardens, and under glass. Nearly three thousand new labels are put up each year so that visitors may readily identify plants they may not know. Portable Exhibit-of-the-Week bulletin boards appear in strategic places from time to time, with human-interest explanations about outstanding or unusual plants or plantings. At each of the three main gates are other bulletin boards that invite attention to special parts of the Garden, or to conspicuous seasonal displays. A map of the main plantings is available to visitors at the Laboratory and Administration Building.

Founded in 1910 by the late Alfred Treadway White, the Garden occupies 50 acres of land belonging to the City of New York. The land has been assigned more or less in perpetuity to a private educational corporation, the Brooklyn Institute of Arts and Sciences, of which the Botanic Garden is a part. As one of New York City's two established Botanic Gardens, it receives about half its support from the city. This is for wages and salaries and for basic care that ranges from lawn mowing and other routine maintenance to coal for the boilers, also for such equipment as trucks, tractors and mowers, and the gasoline to run them.

The other half of the Garden's support comes from its members and friends, the public-spirited citizens who believe in the importance of natural beauty in the lives of people. Gifts and legacies have created an endowment that now amounts to \$1,800,000. The income from this sum plus the dues of 1,500 members, and special gifts from time to time, make up the funds that support a large part of the program. Garden clubs and horticultural

*Reprinted from The Garden Club of America Bulletin for May, 1952, with the kind permission of the editor and of the author, Dr. George S. Avery, Jr., director of the Brooklyn Botanic Garden.



Wide open spaces surround Cranford Rose Garden, 1928
(Reprinted from "40th Anniversary Booklet," Brooklyn Botanic Garden, 1951)

tural organizations have had an ever-increasing share in this support, through membership and special gifts.

How has such a garden been put to work, to make it meaningful to laymen and botanists alike? Historically, botanic gardens have not infrequently been plant curiosity shops but, fortunately, the trend is well away from this kind of establishment. At the Brooklyn Botanic Garden, for example, there is a long tradition of reaching out to help the layman with information about plants; it is primarily an educational organization, and secondarily a park. Nonetheless, it is outdoor host to nearly a million and a half visitors each year, probably one of the busiest gardens in America. On Sunday afternoons in Cherry Blossom Time one frequently sees people four abreast in queues several hundred feet long, waiting at the gates to get in.

The educational program, supported chiefly from gift funds, leans heavily on all facilities the Garden provides, the outdoor as well as the greenhouse plant collections, the library, auditorium and classrooms, and the motion picture and slide collections. Some 15,000 children and more than 1,000 adults participate in this program. For nearly five months of the spring and summer, 250 children have outdoor garden plots, a Garden House managed by older chil-

dren, and an organized but not regimented garden program with emphasis on character building. This program was a pioneer when it began, 40 years ago.

Adult education centers chiefly around 20 or more popular courses, most of which meet at weekly intervals for a total of three to ten lessons. Typical subjects are Landscaping the Home Grounds, Flower Arrangement, Keeping Plants Healthy, Wild Flowers, Flower Painting, Gardening with Herbs, and Flowering Trees and Shrubs. Classes are generally filled to capacity with students from every walk of life: doctors, housewives, teachers, and business men and women. Fees for such instruction range from \$2.00 to \$20.00 but tuition is reduced for members. Class announcements and schedules are sent three or four times each year to individual members and to garden clubs and other organizations which are group-members of the garden.

Although residents of Greater New York and vicinity have an important advantage when it comes to taking courses and attending special garden functions, there are members in 30 of the 48 states. Nonresident members receive all publications, invitations and announcements, share in the distribution of rare and unusual plants, and have their questions answered by mail. In many instances, they also

carry on experimental tests suited to their regions; for example, tests on the hardiness of plants, under the guidance of professional staff members at the Garden.

Projecting the work and the horticultural experience of the Garden is one of its main obligations; this it attempts to achieve through the pages of its popularly written quarterly magazine of horticulture and gardening, *Plants & Gardens*—which goes to 48 states and 26 foreign countries. It is free to members, and the subscription price to non-members is moderate.

The story of public service would not be complete without mention of the two-cent packets (formerly penny packets) of flower and vegetable seeds that are made available to children through the public schools; more than 600,000 packets went to children in the five boroughs of New York City this past year, every packet filled by hand—many of them by volunteers. In the 40 years of this unique service, over 24 million packets of seeds have busied the lives of 8 million school children.

Of less popular interest, but of far-reaching scientific importance, is the research program. This is now concerned mainly with virus diseases of plants, in particular those that are carried by certain insects. One of the viruses under investigation causes a cancer in plants but gives no apparent disease symptoms to the

insect in which it multiplies and which is responsible for its spread.

Thus there are three fields of major activity at the Brooklyn Botanic Garden: provision and maintenance of the living plant collections out of doors and in greenhouses; the program of popular education to make use of these; and the research program. The library of more than 50,000 books and pamphlets and a collection of rare pre-Linnaean works, is the mainstay of both the education and the research programs. In addition, there is an herbarium of about 300,000 specimens; it is open to qualified students and researchers in the field of taxonomic botany.

Visitors are always welcome at the Botanic Garden. No matter what the time of year, there is always something to enjoy—whether it be the fascinating outlines of trees in winter or the Oriental serenity of the Japanese Garden in summer. But amateur horticulturists, gardeners and nature enthusiasts will feel most rewarded if they plan their visits to coincide with seasonal displays.

The grounds are open without charge every day in the year, weekdays from 8:30 to dusk, and from 10 a.m. to dusk on Sundays. The greenhouses are open from 10 a.m. to 4 p.m. on weekdays, and from 2 to 4 p.m. on Sundays and legal holidays.

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The open field of 1928 is now Cherry Blossom Esplanade, Rose Arc in foreground
(Reprinted from "40th Anniversary Booklet," Brooklyn Botanic Garden, 1951)

In Praise of Dwarf Cotoneasters

FRANCES KINNE ROBERSON*

AN ENTIRE GROUP of plants sometimes falls into disrepute because of the shortcomings or over-use of one member, and this seems to have occurred with the low growing cotoneasters. The antlered branches of the widely used *Cotoneaster horizontalis* have become so familiar that people look on them with disdain and forget that there are many other varieties of cotoneaster.

Nor is there any reason to detract from the esteem in which this popular cotoneaster has been held. The fact remains that it is almost indispensable on steep banks where little care or cultivation can be given. Combinations of *Cotoneaster horizontalis* with some prostrate form of *Juniperus chinensis* often prove more effective than either plant by itself.

A tremendous crop of bright red berries is produced each year by established plants of this cotoneaster, so that birds find a natural feeding service wherever these plants occur. Bees keep the air humming around them during flowering season, too, when the pale pink flowers line each stem. An individual branch resembles a fish skeleton in outline during the leafless season in winter, after the closely set small dark green leaves have turned to red and orange, then lost their hold and dropped to the ground.

Next most widely known and used among the low growing members of this genus is *Cotoneaster Dammeri*, often listed as *C. humifusa*. Notable among its good qualities are its gracefully trailing habit, its custom of rooting along the branches for greater sustenance and better anchorage, the size of its evergreen leaves which are two or three times as large as those of the previous species. The withe-like branches weave in and out among other plants without destroying them, or hang close to steep

rocks without projecting beyond them, or crawl along a flat area as a ground cover. The flowers are borne in moderate profusion and give way very quickly to incipient fruits which develop in late summer to bright orange-red berries almost a quarter of an inch in diameter.

Another prostrate member of this group is *Cotoneaster buxifolia* var. *vellaea*. Its stiffly arched branches re-branch frequently to create a densely compact bush of low stature. The slightly woolly undersides of the blue-green leaves fashion a faint margin of gray to outline each one in distinct pattern. The flowers have a barely perceptible trace of pink in the white petals. This variety is reticent to fruit in our garden.

Cotoneaster congesta, also known as *C. microphylla* var. *glacialis* (either name is quite descriptive), resembles the preceding variety quite closely in all respects. Both of them are evergreen, bear coral red berries, and are good bank cover subjects.

One of the most graceful of the dwarf cotoneasters is a deciduous one of very low habit. *Cotoneaster adpressa* is aptly named. Each branch sweeps back to the ground and roots under favorable conditions; the tip again turns up creating an impression of undulating movement. Even in winter barrenness, the branches and slender twigs provoke interest, especially in an exposed position on the rock garden.

All of the foregoing shrubs come from Western or Central China, except *C. congesta* which had its origin in the Himalayan Mountains, all of which tells the story of another horticultural contribution from the Orient.

Little information is available on its ancestry, but Cotoneaster "Tom Thumb" keeps its branches within smaller confines than any of its relatives we have mentioned. It can be recommended as a gem for the scree or rock garden with full confidence that it will please most everyone. Neatness, compactness and interesting line are its chief virtues. The tiny

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*Frances Kinne Roberson (Mrs. L. N.) is always as gracious with her contributions as she is well informed on horticultural topics. It will be remembered that one of Mrs. Roberson's articles, printed in the Bulletin, Spring 1949, "Wayside Plants," was reprinted in the Winter 1949 issue of "Plants and Gardens," the journal of the Brooklyn Botanic Garden, as one of the "Year's Highlights in Horticulture and Gardening."

Larger Leaved Cotoneasters

EDITH H. BANGHART*

DUE to the sloping contour of many of our finest gardens, and to the fact that some of our nicest homes both in the city and outlying districts have been built in such close proximity, it has been necessary in many instances to use and combine with other shrubbery of a commensurate height the lower and dwarfer types of cotoneasters.

Efficacious in the extreme for holding up banks, covering waste spaces, and providing green backgrounds on rock-gardens and terraces, one finds that nurserymen have catered to the "call" of the trade and continue to augment their supply almost entirely with the small leaved, lower growing types.

For this reason, therefore, there are many who are little acquainted with, or cognizant of the fact, that there is an extraordinarily large selection of the taller growing, large leaved varieties. These range in height from six to twenty feet, having leaves varying from three-quarters to three inches in length, according to the condition of the soil and the exposure in which they are grown.

Some cotoneasters are deciduous, but many are evergreen, and what makes them so desirable is that they are willing to tolerate almost all types of soil and conditions. Their flowers are usually pink or white and fragrant.

To me the taller growing cotoneasters present features of charming distinction; not only are they extremely dainty and singularly individual in their drooping and natural silhouettes, but they advantageously fill so many niches that there is hardly any other shrub that can so appropriately boast as much merit for all-around garden suitability.

For instance, not only are they most effective as backgrounds for the lower types, but they are ideal as a buffer planting along side lines, where taller growing shrubs and trees would not be permissible due to the fact that a

neighbor's view might be obscured.

Besides bringing glistening highlights into the surroundings from glossy deep green foliage of some types, or grey-green and tomentose in others, and dark bronzy-red leaves of still others, their berries are so varied and beautiful that their autumn coloring of red-scarlet, orange, yellow, salmon, brown, purple, and black, is wholly distinctive and completely indispensable in a late summer and fall garden.

Activity and life are brought close to home also. Bees and humming birds are especially busy when the cotoneasters' fragrant blossoms are in bloom. One comes in close contact, too, with feathered friends, as there are many birds who edibly enjoy the colorful berries.

Interesting hedges can be grown that deviate from the commonplace. For these, especially attractive are the *multiflora* types, and the lovely *C. Simonsii* is excellent material which adapts itself particularly well. Judicious pruning should be practiced, however, in this type of hedge—it cannot be closely clipped as with English privet.

I have also admired appropriate specimens artistically espaliered against both brick and stone walls, and used as standards they are completely ideal.

I have in mind an exquisitely lovely old garden I visited in Mexico City. In front of a 20-foot hedge of clipped English Box, which was topped with the most fascinating topiary work I have ever seen, there stood long rows of eight-foot standards of the lovely silvery-grey leaved *C. Franchetii*.

These were alternated with blooming standards of the very beautiful old-fashioned favorite white rose—*A. K. Viktoria*—a truly cool and charming arrangement, and one long to be remembered.

Cotoneasters of the *C. Franchetii*, *frigida*, *salicifolia floccosa*, and *bullata* types lend themselves extremely well for standard specimens, and graft quite easily on either hawthorn, crab apple, or mountain ash whips.

*We welcome another excellent article from Mrs. Edith H. Banghart, noted garden lecturer. Mrs. Banghart's last article in the Bulletin, published in the Summer 1949 issue, was a most comprehensive discussion on "Shade Loving Shrubs."

The appropriateness has been questioned at times as to the advisability of growing cotoneasters in a choice shrub collection, due to the fact that certain specimens might harbor the wheat rust, codling moth, and in some instances even red spider. Effective control is not difficult, however, with the many new sprays available, and I personally find that good old lime and sulphur handles the situation beautifully.

Many cotoneasters hail from the Himalaya, Tibet and China; others from Siberia, Spain, and S. Europe. Collectors from England and the United States have brought in a great many hybrids, many of them commonplace and of little value. There were, in Mr. Wilson's collection, however, some very fine types, although many have been listed by number only, and are not to be found in the trade.

Cotoneasters are propagated from seed (first freeze or stratify) and from cuttings in late summer or fall.

The list of types being so long and varied, and as I said above many being commonplace and of little garden value, I will enumerate only those that are known to have horticultural merit.

ACUMINATA: An erect shrub to six feet, oblong leaves to one and a half inches, with richly colored *deep scarlet* berries.

ACUTIFOLIA: Shrub to twelve feet, slender branches—long leaves—*black* berries.

BACILLARIS: Tall shrub to twelve feet, long leaves, shiny attractive *black* berries.

BULLATA: Spreading shrub to six or more feet: corrugated grey-green leaves, very large *red* berries. The forms *floribunda* and *macrophylla* (Wilson) are very handsome in both flower and fruit.

CORNUBIA: Vigorous growing hybrid to 20 feet, huge *dark red* berries in profuse abundance.

DIELSIANA: (*applanata*) and varieties *major* and *elegans*: Beautiful shrubs to eight feet, leaves are often an inch long, branches slender and spreading, berries are *bright red*.

FOVEOLATA: A shrub to ten feet, with grass-green foliage turning orange-scarlet in the fall; the berries are shiny *black*.

FRANCHETII: One of the choicest. Graceful arching branches, grey-green foliage to inch and a half long, handsome berries of a bright *orange-scarlet* hue, particularly fine for standards.

FRIGIDA: Handsome specimen from Himalaya. Most striking of all. A little tender in some sections. Arching branches, long colorful leaves, and bright *orange-red berries* beautifully placed along its stems. Deciduous.

HARROVIANA: Particularly lovely when in flower. Long arching branches, with grey-green willow-like foliage. Abundant *scarlet* berries, and especially fine for large rock garden.

HENRYANA: Graceful evergreen with long dark green leaves, beautiful *crimson* berries. Well thought of in the trade, and not hard to come by.

INTEGERRIMA: Shrub to five feet. Long green leaves slightly tomentose beneath, profuse *bright red* berries.

LACTEA: Distinct in its large, leathery leaves, very grey and tomentose beneath, *bright red* berries.

LUCIDA: Upright shrub from Siberia. Dark glossy leaves, brilliant autumn coloring, berries a beautiful lustrous *black*. Deciduous.

LINDLEYI: Elegant Himalayan species, long weeping branches growing to twelve feet. Handsome *black* berries.


MELANOCARPA (*laxiflora*): Siberia. Long leaves, clusters of shiny *black* fruit.

MEYERI (of the trade): Grows to six feet, pendulous branches, grey-green leaves, has *coral* berries.

MOUPINENSE: Similar to *C. bullata*. Foliage very handsome, sometimes two inches in length. Shiny *black* berries.

MULTIFLORA: Popular species from W. China. Graceful shrub, pendulous arching branches, bright *red* fruit. *Calocarpa* especially fine type; leaves are tomentose, often

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Oxydendrum arboreum—taken in Arboretum (Montlake area) early September, 1950.

—PHOTO BY E. F. MARTEN

ARBORETUM SPOTLIGHT

From the Land of Sourwood Honey

THERE are a few shrubs used in the garden which "become busy about many things" at one particular season of the year.

For example, in October and November, the Strawberry tree, *Arbutus Unedo*, displays its flowers and strawberry-like fruits simultaneously as one bouquet.

Those gardeners who are ever on the lookout for late summer blooming shrubs should be aware of another "busy" one highly valued for its late bloom and brilliance of foliage color. Such an accommodating plant is the Sourwood, *Oxydendrum arboreum*.

In early August, whitish flower buds appear in clusters at the end of the branches amid the leaves shading bronzy-red. By late August the urn-shaped flowers are a creamy white, while the foliage is deepening to scarlet. In September and October the faded flower heads continue the effect of bloom against the brilliant scarlet leaves, making this one of the most outstanding shrubs in the landscape.

Sourwood is one of the deciduous members

of the *Ericaceae* (Heath) Family. This association is easily established after one notes the resemblance of its flowers to those of the Madrona tree, the ground cover shrub Salal, or to *Pieris japonica*, commonly known as lily-of-the-valley shrub. The summer foliage is a glossy green, the leaves closely resemble those of a peach.

Tolerance to sun or dense shade is a worthy quality of this shrub. It is adaptable to various types of western Washington soils; however, a light sandy soil with abundant humus seems to favor its growth.

Oxydendrum is found growing in the eastern states as a slender tree of 50 to 70 ft. In western gardens it is seldom seen over 20 feet in tree form and most commonly is grown as a shrub of multiple stems ranging in height from 6 to 10 feet. In the garden it is equally suited for specimen use or for background planting. At best it is slow growing, never getting out of hand.

Visit Woodland Garden to see the Sourwoods in their glory this fall.



Western Red Cedar

(*Thuja plicata* D. Don.)

C. FRANK BROCKMAN

WE moderns recognize the western red cedar as a source of shingles, shakes, siding, and other needs requiring durability—one of the inherent qualities of its wood. The pioneers of the Pacific Northwest found it of even greater importance. Its straight-grained wood was easily split and consequently they found it admirably suited for use in the construction of cabins and for fence rails. In addition, more than one newcomer to the northwest, weary from the long trek over the Oregon Trail, found that a large hollow cedar stump, roofed with shakes made from wood of the same species, provided an acceptable shelter from the elements until the essential work of clearing land and constructing a more proper dwelling had been undertaken. To the aboriginal peoples of the Pacific Northwest the western red cedar was of even greater importance. In a sense it can be said that this tree furnished the Indians with the three necessities of life—shelter, clothing, and food. For their lodges were built of cedar planks; they used the inner bark of this species in the fabrication of wearing apparel; and their large and distinctive canoes, fashioned from huge cedar logs, enabled them to travel about on the bays, estuaries, rivers, and even the great Pacific in search of food.

Truly, then, the western red cedar should be of more than passing interest to those of us living in this region. In addition, one finds it a tree of singular beauty, especially when growing under natural conditions in the forest. Its crown, usually irregular, is characterized by long branches which sweep gracefully downward to slightly upturned ends. This, together with the fact that the foliage is flat and scale-like and a dark lustrous green in color, gives the branches a handsome fern-


like appearance which is distinctive among associated trees.

The small, oblong cones are equally characteristic. Borne in great abundance, they are less than one-half inch long, erect upon short stems, and characterized by only a few scales joined at the base. Each scale bears a short prickle near its apex. Bright green in early summer, the cones take on a reddish to cinnamon-brown hue by fall. Often one may find old, open cones—from which the small, double-winged seeds have been shed—upon the branches as a new crop is forming.

At this latitude the western red cedar is most common from sea level to an elevation of about 4000 feet where there is abundant moisture and high humidity, being typical of wet to even swampy soils. Where conditions are suited to its best development, mature specimens may be from 150 to 200 feet tall and from three to eight feet in diameter. Larger specimens are not uncommon, however. In the cedar swamps of the Ohanapecosh, in the southeastern corner of Mount Rainier National Park, one will find western red cedars up to twelve feet in diameter. The trunks of such large trees exhibit excessive taper, being greatly buttressed and fluted at the base. In the deep forest the tree is usually free from limbs for a considerable distance, and one may readily observe the character of its distinctive bark. This is thin, dark gray to reddish-brown in color, and of a shreddy and fibrous texture.

Except for its much greater size, the western red cedar bears considerable resemblance to the arborvitae or northern white cedar (*Thuja occidentalis*) of the Lake States. Thus it might more properly be termed “giant arborvitae” since, in spite of its common name, it

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Western red cedar, showing buttressed
base of trunk. 

—PHOTO BY C. FRANK BROCKMAN

Continuing our series of notes on Native Trees of the Pacific Northwest by Prof. Brockman of the University's School of Forestry.



The Raising of Rhododendrons From Seed

We are very happy to be able to present to our readers, especially the many interested in Rhododendrons and Azaleas, the combined experiences and recommendations of several of our prominent Pacific Coast Northwest growers.

Raising Rhododendrons From Seed

CARL S. ENGLISH, JR.

AND EDITH HARDIN ENGLISH

RHODODENDRONS may be raised from seed in various ways, the choice depending upon conditions prevailing and equipment available. Whatever the approach to the procedure, two major requirements are evident: first, the proper selection and preparation of soil for the seed flat, and second, diligent care of seed and seedlings.

The following method has given successful results:

Make up small-sized, new, cedar flats approximately 8x12x1½ inches in size. Let them weather out of doors for at least two months. This is necessary because freshly cut material is toxic to seedlings.

Prepare a soil mixture consisting of two parts of finely screened commercial peat of good quality and one part of superfine sand. This mixture should be moist but not wet.

To the peat-sand mixture that will cover the bottom one-fourth inch of the flat add, and mix well, a handful of powdered sheep guano. Use the plain peat-sand mixture to fill the remainder of the flat and firm it down well, especially around the edges and at the corners of the flat.

If several kinds of rhododendron seed are to be sown, mark off their respective sections of the flat, arranging contrasting kinds adjoining each other, such as small-leaved species next to those with large leaves so that the seedlings will be more easily recognized at transplanting time. Do not sow too thickly and do not cover the seeds at this time. They can be settled into the surface by spraying with a very fine mist of water such as would be produced by an atomizer. Place the flat in a soaking tray in order that it will take up moisture from below, then drain.

Arrange a sweat box with one or two inches of wet peat in the bottom. The use of some form of heating device, such as an electric cable or light bulbs placed below, is optional. If used, the temperature should be between 60 and 70 degrees F. An apple box makes a satisfactory sweat box for a single small flat.

In order that the flat will have circulation of air about it and also freedom from invading vermin, stand it on four inverted flower pots or, if necessary, on stacks of several flower pots inside the sweat box. The flat should be so placed that its surface will be in the upper part of the sweat box.

Cover the sweat box with with a pane of glass, placing a layer of newspaper between the glass and the seed flat to absorb the moisture and prevent it from dropping on the seed flat. This paper needs to be replaced as frequently as it becomes saturated with moisture.

After a period of three to six weeks the seed will begin to germinate. At this time have on hand some finely screened, preferably fresh, sphagnum moss. Sift this lightly over the seedlings to give them anchorage. A second application may be necessary at a later date as the seedlings grow.

When the cotyledons of the seedlings begin to spread, remove the flat from the sweat box during the day and prop the flat in the direct sunlight, turning it during the day so that it will continue to receive the direct rays of the sun. In addition to developing sturdy little plants this attention will help greatly to discourage the growth of fungus and damping off organisms. Water as required by placing the flat in a soaking tray. At night place the flat back in the sweat box. When the seedlings are about a month to six weeks old the use of the sweat box may be discontinued.

If fungus or damping off should appear, pick out the affected seedlings with tweezers so as

to prevent the spread of disease to other seedlings.

In case the little plants seem slow in their growth they may be given greater vigor by the application of a very well-diluted fertilizer such as the liquid fish preparations. Care must be used to make this mild enough that it will not injure the tiny seedlings.

When the seedlings begin to show evidence of crowding it is time to transplant them to other flats, using the same sand-peat mixture that was used in the seed flats. If the seed is planted early, between December 15 and March 1, the seedlings will be ready for transplanting that spring or summer. Seedlings from later plantings may be held over until the following spring before transplanting.



Alpine Rhododendrons from Seed

MRS. J. F. CAPERCI

Growing alpine rhododendrons from seed has been a very simple and satisfactory process for us. We have excellent results from our method, and sincerely hope that if you try it, you will too. Our alpiners are most hardy, and we have found that they do not require any special or fancy handling to make them grow. The simplest method is best.

First of all, during the flowering season we select and mark the plants from which we will take seed. Early flowering plants are brought into the cold house before flowering to prevent loss of the flower by late frosts. Species rhododendrons are self-pollinated. Crosses are made and tagged.

We gather our seed in the fall after we have had a couple of frosts or good cold snaps. This is usually early in November. Although the seed may show some green, they are ready at this time. Seed is gathered and placed in ordinary envelopes, then brought into the house to allow them to dry out and crack open. After the pods have cracked open, we screen the seed to eliminate any chaff or pods. Then the seed is replaced into the envelopes and

allowed to further dry for a couple of days, when they are planted. We do not stratify our seed, or use any kind of preparation on them.

Now we prepare our flats. They are filled with a preparation of about $\frac{3}{4}$ peat, and the other fourth of sand, vermiculite, and ordinary garden soil. The flats are soaked thoroughly, and allowed to drain off.

Now we sow our seed. This is done by merely sprinkling the seed evenly as possible over the prepared flats. We do not cover the seed with anything. From here on we do absolutely nothing but water with a fine spray on an ordinary garden hose, being careful not to disturb the seed. Here again we use nothing special, just cold water from the tap.

We use very little heat, just so that the temperature does not drop below 45 degrees. One year our heat failed and the temperature dropped almost to freezing. Except for the fact that the seeds took longer to germinate, it didn't hurt them a bit. We keep a circulating fan going at all times to prevent damping off of the seedlings. Seed will start to germinate in approximately three weeks.

We like to wait until our seedlings have fairly well hardened off before transplanting them. Sometimes this takes as long as three or four months. We transplant into flats prepared as before with a slightly richer mixture. This mixture is of about $\frac{7}{8}$ peat and leaf mold, other $\frac{1}{8}$ sand and vermiculite. We use small flats that are easy for us to handle, and into which we usually get at least 100 seedlings.

The seedlings are left here until they outgrow their flats. Then they are transplanted. Some are put into pots to be carried over another year in the green-house, but the majority are planted directly into the open ground with lath shade. They are mulched lightly with peat or sawdust. Ordinary care is all they need now. Keep them free from weeds, provide plenty of water, and loose soil. Now they are on their own, and we watch them grow.

Rhododendrons from Seed

W. RYLAND HILL

THIS note is addressed to the amateur gardener who wishes to raise species rhododendrons from seed.

Seed. Seed can come from your own plants, be begged from friends, or purchased for a nominal sum from a grower. The seed capsules are collected in late fall or early winter and put into envelopes to dry and spill out the fine seed. One pod usually contains more seeds than any amateur should plant of one species. Seed from hybrids may give a disappointing collection of plants; from a species the natural variation may require later selection for best forms. This is particularly true of the blues and the *Triflorum* series.

Use only fresh seed collected the same season and plant as soon as possible in the year. Having a warm greenhouse permits January planting, but it is better not to plant until March if you wish to use the kitchen window sill as a greenhouse.

Planting. I find it convenient to plant in a small flat about a foot square and 4 inches deep with a burlap-covered wire-mesh bottom to provide drainage. The soil mixture typically consists of sifted peat moss, sand, and garden loam in about equal parts, although I have also employed rotten stump in place of peat and very well rotted manure as part of the soil. The final mixture must be porous with no tendency to cake. The use of composts and manures tends to favor the growth of molds and moss and I now sterilize all but the peat in a closed kettle for several hours in an oven set for 250°F. Let the sterilized soil stand for several days before making the final mixture and fill the flat to a depth of about 2½ inches.

The flat can be divided 4 ways with small marker sticks and planted with 4 different kinds of seed. Plant sparingly by dropping the seed onto the loose soil surface and partially cover with a fine sifting of peat moss. Then press down the soil with a flat piece of wood to imbed the seed and establish good capillary paths to the moist under-layers. Last,

immerse the whole flat in water to saturate the soil, taking care not to float the seed. Cover the flat with a piece of glass leaving one-inch cracks for ventilation. A weekly soaking will ordinarily keep the surface moist.

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Rhododendrons and Azaleas From Seed

LESTER E. BRANDT

THE most important factor in raising rhododendrons and azaleas is seed that is fresh. Seed of the current year that has been well ripened will germinate practically 100%; seed a year old will germinate poorly, and the plants will be weak; and seed older than a year is not worth planting.

The next most important thing is the germinating medium. I have tried a number of mixtures recommended by growers both here and abroad, but I have found that baled horticultural peat moss, lightly but firmly packed in the flat or pan, and topped with ¼ inch of dry screened sphagnum moss, will give the best results.

I have sown seed from August 10 up until March 1, but have found that sowing from January 1 to 15 is the best.

Some authorities recommend placing the pans or flats in a closed propagating case, with a temperature of 65° to 75°, but the seed will germinate as well, and the plants will be sturdier if grown on a bench in a cool greenhouse, covered with a pane of glass until germination takes place.

Do not sterilize the peat, or use any fungicide. The sphagnum will help prevent damping off, and sterilizing will kill the mycorrhiza that seems to be present, and which the plants need.

About two to three months from sowing, the plants are generally ready for the first transplanting. Again I use mostly peat moss, with about ⅓ woods leaf mold, and a little sand. They can stay in the flats a year or so, and are then ready to go out into a frame or the open ground.

Rhododendrons

W. RYLAND HILL*

HAVING recently discovered, to my dismay, that I knew faintly a scant majority of the members of the Editorial Board of the Arboretum Bulletin, and having had first-hand experience with editorial boards and the problem of obtaining material for publication, I was certain that sooner or later the call to words would come.

What to write on rhododendrons is something of a problem, especially in a publication boasting of such authors as Cox, Herbert Ihrig, Mrs. Frye and Mrs. Dowling. But in the choice of title I have taken advantage of an important characteristic of rhododendron fans. One has merely to *mention* the word rhododendron and they avidly scan whatever appears below.

The time has come for all of us to sit back and take stock. Why do we cherish rhododendrons so? What are their virtues and their faults? What is so mouth watering about a new species that no one else in town has yet got? Why do we spend half our lives waiting for one to bloom? Surely one must have momentary doubts about all this. Certainly other people (non rhododendron fans, that is) do.

Before we go any further I want to make it plain that we shall talk only of species. One can hardly say a harsh word about hybrids. Not that they are any better, of course, but each hybrid has had a mother, so to speak, and we know what mothers are like! Who would dare say an unkind word about Beautiful Bells, for example, sired by I. B. Fuddle out of Low Hill Nursery somewhat south of Cornwall? Why, we should have an international incident out of it in no time. Let the Anglo-American alliance stand!

Well, back to the species. Take *Rhododendron lutescens*, for instance. I can remember reading in a local catalog of the "elfin daintiness of its hanging primrose-yellow bells

swinging in the spring breeze and lightening up the landscape with its lovely color". Five years ago I begged seed, planted, transplanted, mulched, transplanted, manured, shaded, and waited. Now what have I got? I have several leggy (too much shade) plants with rather poor winter foliage (too much sun) which bloom sparingly (too much shade) with rather small blooms of a washy yellow color. (too much sun). No self respecting forsythia would *dream* of being caught with such a poor display. Of course, I *much* prefer *Rhododendron lutescens* to forsythia—of course.

I have also had experience with *Rhododendron arboreum*. My plants are somewhat older than my growing children. They have had better care, too—at least I haven't kicked or yelled at them as my wife once pointedly remarked. One of them did bloom once—that was the year I moved out into the country to provide space for the plants that had once been little things in flats. The moving nearly killed it so it spent its last breath in producing a gorgeous funereal show of flowers. But it didn't quite die. It just stood still for a year. Then came the hard winter of 1949 and it slipped back a little. This year I think it is really growing. Of course, with a hardiness rating of "D" I might just as well expect its future demise, when I shall have to relegate it to the fireplace. If it just manages to live another ten years I think that it will make quite a jolly fire.

Along with the *lutescens* episode I also raised 100 *Rhododendron Augustini* from seed. Each root ball now weighs about 20 pounds so I have had the privilege of lifting about a ton of *Augustinis* from pillar to post. Now I am discarding. The first one bloomed with a weak muddy lavender color but with good foliage so I gave it away—my wife wouldn't let me burn it. The next had better color but poor foliage. I will possibly end up with three of such a lovely blue-violet (any reasonably

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*Mr. W. Ryland Hill is associate professor of Electrical Engineering at the University of Washington.

Sumacs—Relatives of Poison Ivy*

FREDERICK G. MEYER†

The sumacs merit considerable praise as ornamentals. Few woody plants can vie with them for brilliancy of autumn coloration. Other groups, as for instance, maples, oaks, huckleberries, hickories noted for colored foliage cannot always be relied upon on account of "off years," but the foliage and fruit of sumacs rarely fail to give a blazing autumn display of tantalizing appeal. Even in midsummer, most sumac species command an important position on account of their shapeliness, attractive foliage and luxuriant growth. The sumacs as cultivated plants stand in long repute, both in American and European gardens. The American smooth sumac (*Rhus glabra*), for instance, has been cultivated since 1620, well over 300 years.

The sumacs belong to the family of *Anacardiaceae* (Cashew-nut family). They are temperate zone representatives of a large, predominately tropical plant family with many important economic members, as, for instance, the mango (*Mangifera indica*), *Spondias*, cashew-nut (*Anacardium occidentale*), pistachio nut (*Pistacia vera*), lacquer tree of Japan (*Rhus vernicifera*), to mention a few. Besides the sumacs, the only members of the family commonly cultivated in temperate regions are the European smoke tree (*Cotinus Coggygria*), and the American smoke tree (*Cotinus americanus*).

The sumacs of the genus *Rhus* have nearly a world-wide distribution with about 100 species, approximately half of which occur in North America from southern Canada, the

United States, through Mexico and Central America. About fifteen to eighteen non-poisonous species of American, European, and Asian origin are known in northern gardens, with several yet to be introduced. The genus includes as well, a host of poisonous species, two of which occur in the western United States and are familiarly known as Poison Ivy and Poison Oak. Although not recommended for ornamental planting, it is hoped their inclusion here will help to clarify some of the confusion which persists in distinguishing poisonous sumacs in the wild.

A simple, double-choice (dichotomous) key follows as a method of identifying with some accuracy the sumacs listed in this account, and, for questionably named or unnamed sumacs this key will be of help. To use the key, the method is simple. Begin with the major heading "A" and continue through the appropriate pairs of letter symbols that follow; or, follow immediately to "AA" if the combination of characters "A" does not apply. Then go to "B" or "BB," etc., etc., by following the same procedure. Always select the combination of phrases that describes the plant most accurately. By continually eliminating the phrases that do not apply and selecting the ones that do, the plant name will soon appear in bold face, and—success!

The species listed are classed as hardy in climatic zones VII and VIII (Rehder, "Man. Cult. Trees and Shrubs," ed. 2, 1940), west of the Cascade Mountains in the states of Washington and Oregon.

A. Leaves all divided, deciduous.

B. Leaflets 3.

C. Plants sometimes climbing, or erect; flowers in loose panicles (lilac-like); fruit smooth, white when mature.

D. Apex of leaflets acute, margins smooth or toothed; absent on Pacific Coast but common inland over much of the United States.

1. **POISON IVY** (*Rhus radicans*)

*The derivation of the common English name possibly is derived from the ancient Arabian "sommaq." The generic name *Rhus* is apparently of Greek origin. The "sumach" (*Rhus coriaria*) of south Europe and Asia Minor was known to Theophrastus, who mentioned this plant in his

writings nearly three centuries before the Christian era. The native American species are called "sumac" or colloquially "shoo-mac."

†Dr. Frederick G. Meyer, dendrologist of the Missouri Botanical Garden, St. Louis, Mo., contributes this very comprehensive article on Sumacs.

- DD. Apex of leaflets obtuse, margin scalloped; replaces the former species on the Pacific Coast.
 - 2. **POISON OAK** (*Rhus diversiloba*)
- CC. Plants erect, never climbing; flowers in dense, catkin-like heads; fruit hairy, red when mature.
 - D. Leaflets broadest above the middle (obovate) without hairs, ½-1 in. long, with few rounded teeth; western U. S. eastward to Illinois.
 - 3. **ILL-SCENTED SUMAC, SQUAW BUSH SKUNK BUSH** (*Rhus trilobata*)
 - DD. Leaflets broadest about the middle (ovate), with hairs, 1-3 in. long, scalloped-toothed; eastern U. S.
 - 4. **FRAGRANT SUMAC** (*Rhus aromatica*)
- BB. Leaflets 5 or more.
 - C. Axis of divided leaves flattened or wing-like.
 - D. Leaflets 9-15, obtusish, rarely over 2 in. long; Mediterranean region and western Asia.
 - 5. **EUROPEAN or SICILIAN SUMAC** (*Rhus coriaria*)
 - DD. Leaflets acute, over 2 in. long.
 - E. Leaflets 7-13, coarsely toothed, base usually rounded. China, Japan.
 - 6. **CHINESE SUMAC** (*Rhus chinensis*)
 - EE. Leaflets 9-21, not or with few teeth, base triangular.
 - F. Wing-like axis dividing leaflets prominent; leaflets lance-elliptic or lance-ovate, ½-1 in. wide. Eastern U. S.
 - 7. **SHINING SUMAC** (*Rhus copallina*)
 - FF. Wing-like axis barely perceptible; leaflets strongly sickle-shaped, ¼-½ in. wide. Oklahoma to Mexico.
 - 8. **TEXAS SUMAC** (*Rhus lanceolata*)
 - CC. Axis of divided leaves essentially round in cross section, if wing-like then only on the upper part.
 - D. Leaflets untoothed (toothed in young plants of Nos. 12 and 12).
 - E. Leaves crowded at end of branches; flowering stalk borne in the axil of branches, erect; fruit whitish, brownish or yellow.
 - F. Leaflets lustrous and shining on upper surface, long pointed. Japan, China, Himalaya.
 - 9. **WAX TREE** (*Rhus succedanea*)
 - FF. Leaflets dull and sometimes hairy on upper surface, short-pointed.
 - G. Leaflets 13-17, each with 10-16 pairs of veins. China, Japan, Korea.
 - 10. **RHUS TRICHOCARPA**
 - GG. Leaflets 7-13, each with 18-25 pairs of veins. China, Japan, Korea.
 - 11. **JAPANESE WOODLAND SUMAC** (*Rhus sylvestris*)
 - EE. Leaves distributed along the branches; fruit red.
 - F. Leaflets 5-7, rarely to 9, distinctly stalked; branches smooth; axis of divided leaves round. Central and western China.
 - 12. **POTANIN'S SUMAC** (*Rhus Potaninii*)
 - FF. Leaflets 7-11, rarely to 17, sessile; branches hairy. Central and western China.
 - 13. **RHUS PUNJABENSIS** var. **SINICA**
 - DD. Leaflets toothed.
 - E. Leaflets whitish beneath; large shrubs over 3 feet tall when mature (vars. of Nos. 14 and 15 with leaves much dissected).
 - F. Branches and leaflets smooth. Native over much of the U. S.
 - 14. **SMOOTH SUMAC** (*Rhus glabra*).
 - 14a. var. *laciniata* with dissected leaves
 - FF. Branches and leaflets densely hairy. Native of northcentral and northeastern U. S.
 - 15. **STAGHORN SUMAC** (*Rhus typhina*)
 - 15a. vars. *laciniata* and *dissecta* with dissected leaves
 - EE. Leaflets densely brownish, hairy beneath; low shrub to 3 feet tall. North Carolina.
 - 16. **MICHAUX'S SUMAC** (*Rhus Michauxii*)
 - AA. Leaves divided or undivided, evergreen.
 - B. Leaves undivided.
 - C. Leaves mostly lance-shaped to oblong-ovate, never toothed, rarely 3-lobed; shrub exhaling an aromatic odor. Southern California.
 - 17. **LAUREL-SUMAC** (*Rhus laurina*)
 - CC. Leaves mostly ovate (egg-shaped), sometimes spiny-toothed.
 - D. Leaves 1-2 in. long, apex usually obtuse. Southern California.
 - 18. **LEMONADE-BERRY** (*Rhus integrifolia*)
 - DD. Leaves 2-3 in. long, apex acute. Southern California.
 - 19. **SUGAR-BUSH** (*Rhus ovata*)
 - BB. Leaves divided, leaflets mostly 5-9. Oklahoma to northern Mexico.
 - 20. **TEXAS EVERGREEN SUMAC** (*Rhus virens*)

1. POISON IVY—*Rhus radicans* (syn. *R. Toxicodendron*). POISONOUS.

The poison ivy can hardly be recommended for ornamental planting, despite its superlative traits of luxuriant growth and brilliant autumn coloration. It is a plant to be admired from a safe distance. Remember to recognize the poison ivy by the shiny 3-lobed leaves with smooth-margined, long-pointed leaflets 1½-9 in. long; the whitish flowers in lilac-like shaped panicles in spring followed by white berries in summer and autumn further distinguish the poison ivy. It assumes several growth forms from an upright sprawly shrub, 4-6 feet tall, to a rank climber 20-30 feet tall. Occurs wild in most parts of the United States except the Pacific slope. Cultivated in 1640. (Illus. D)

2. POISON OAK—*Rhus diversiloba*. POISONOUS.

In the Puget Sound region and along the Pacific coast to southern California, the poison oak replaces the poison ivy, although these species are closely related. In contrast, the Pacific coast species has smaller leaflets, each 1-3 in. long and with scalloped margins. In the Puget Sound region, the poison oak is usually an upright shrub, 3-5 feet tall, but southward, especially in the redwood belt of northern California it is a true climber. Not recommended for planting. (Illus. I)

3. ILL-SCENTED SUMAC, SQUAW BUSH—SKUNK BUSH—*Rhus trilobata* (syn. *Schmaltzia trilobata*). HARMLESS.

Skunk bush is perhaps an apt name for this native American sumac on account of the offensive odor of the leaves. But it is truly a handsome shrub and deserves more attention as an ornamental, especially for the very attractive hairy red berries during summer. The ill-scented sumac is an erect or somewhat sprawly shrub from 3-6 feet tall, with attractive yellow catkin-like flower heads along the bare stems in early spring followed by the 3-lobed leaves which turn a glowing red in autumn. Native of western United States eastward as far as Indiana. Introduced in 1877. Zone (V). (Illus. E)

3a. *Rhus trilobata* var. *serotina* (syn. *R. aromatica serotina*) is a late flowering variety, native of mid-western United States. Regarded as intermediate between *R. trilobata* and *R. aromatica*. Cultivated in 1929.

4. FRAGRANT SUMAC—*Rhus aromatica* (syn. *R. canadensis*). HARMLESS.

The fragrant and ill-scented sumac look deceptively alike to the untrained eye, but the size and lobing of the leaves and whether the leaflets are broadest above or at the middle of the leaflet will usually distinguish these closely related sumacs. The fragrant sumac usually grows larger, up to 4 feet tall and with much larger leaflets, 2-4 in. long and widest at or just below the middle. A very desirable shrub for dense shade as well as full sunlight; in both situations attractive orange or scarlet foliage appears in autumn. It is one of the best shrubs I know for cutting and taking indoors. Native of eastern United States. Introduced in 1759. Zone (V). (Illus. G)

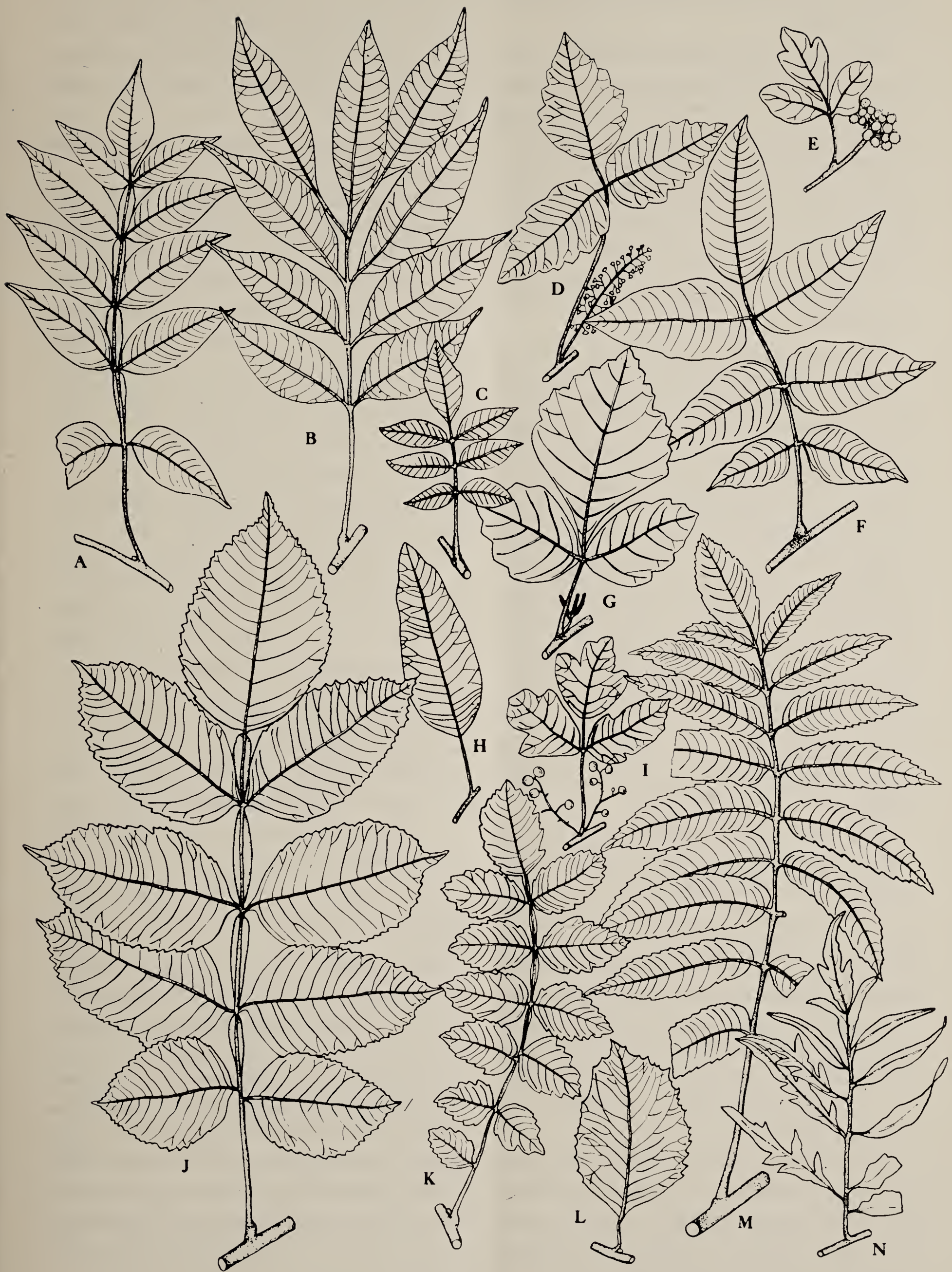
5. EUROPEAN or SICILIAN SUMAC—*Rhus coriaria*. HARMLESS.

This, the only native European species of the genus *Rhus*, is the original "sumach" of the ancients. The European sumac is a striking shrub to 20 feet tall and much branched with divided leaves consisting of 9-15 notched leaflets of ferny appearance. In this country it is rarely cultivated probably on account of its tenderness; but it ought to thrive successfully west of the Cascade range in Washington and Oregon, in California and the southern states.

This sumac is a valuable economic species. The female plants produce 24 per cent tannin, and the male plants 28 per cent or more. Large quantities of this by-product formerly were imported into the United States for the leather industry. Native of the Mediterranean region and Asia Minor. Cultivated in 1648. Zone (VII). (Illus. K)

A. Shining Sumac (*R. copallina*); B. Wax-tree (*R. succedanea*); C. Texas Evergreen Sumac (*R. virens*); D. Poison Ivy (*R. radicans*); E. Ill-scented Sumac (*R. trilobata*); F. Potanin's Sumac (*R. Potaninii*); G. Fragrant Sumac (*R. aromatica*); H. Laurelsumac (*R. laurina*); I. Poison Oak (*R. diversiloba*); J. Chinese Sumac (*R. chinensis*); K. European Sumac (*R. coriaria*); L. Sugar-bush (*R. ovata*); M. Smooth Sumac (*R. glabra*); N. Smooth Sumac variety (*R. glabra* var. *laciniata*).

—DRAWINGS BY LILLIAN MEYER.



6. CHINESE SUMAC — *Rhus chinensis* (syn. *R. javanica*, *R. semialata*, *R. Osbeckii*). HARMLESS.

Among the exotic sumacs cultivated in the United States, the Chinese sumac is perhaps the best known. This species is a large shrub or small tree to nearly 25 feet tall, and as an ornamental, it is much valued for the large creamy white flower clusters which rise in late summer above the broad coarsely toothed leaflets. Native of China and Japan. Cultivated in 1784. Zone (V). (Illus. J)

7. SHINING SUMAC — *Rhus copallina*. HARMLESS.

The shining sumac deserves high praise as an ornamental among the native American species. In Missouri, where this species is one of the common woodland shrubs, it often grows to 20 feet tall. The smooth, lustrous and somewhat drooping leaves with winged axis are most attractive in summer, but especially so in autumn when the foliage turns reddish purple of an almost shimmering brilliance. This species reproduces by underground suckers which is an obnoxious trait, but nonetheless it is highly recommended for inclusion in shrub collections. Native of central and eastern United States. Cultivated in 1688. Zone (IV). (Illus. A)

8. TEXAS SUMAC — *Rhus lanceolata* (syn. *R. copallina* var. *lanceolata*.) HARMLESS.

The Texas sumac differs most markedly from the shining sumac by the narrower sickle-shaped leaves. In growth habit these species are indistinguishable, but for ornamental purposes, the Texas sumac deserves to be grown on account of the distinctive leaves. No doubt rarely cultivated under the above name, and probably less hardy than the shining sumac. Native of Oklahoma southward to northeastern Mexico. Zone (VI.)

9. WAX-TREE—*Rhus succedanea*. POISONOUS (sap)

The wax-tree is rare in cultivation in this country, although at present, the Morton Arboretum reports growing it. This is a tree to nearly 30 feet tall with thick, lustrous, long-pointed leaflets and ought to be an at-

tractive species once established. In the Orient, this plant is important for lacquer, and the wax surrounding the white berries is used in Japan for making candles. Native of China, Japan and the Himalaya. Cultivated in 1863. Zone (V). (Illus. B)

10. JAPANESE SUMAC — *Rhus trichocarpa*. HARMLESS.

The Japanese sumac develops into a tree to nearly 25 feet tall in its native habitat. It is, on the other hand, rare in cultivation in this country, although at present it is growing in the Arnold Arboretum where it was introduced by Prof. Sargent from Japan in 1890. It deserves to be grown more generally on account of the orange and scarlet foliage in autumn; the petioles of young leaves are bright red. Native of China and Japan. Introduced in 1890. Zone (V)

11. JAPANESE WOODLAND SUMAC—*Rhus sylvestris*. HARMLESS.

E. H. Wilson describes this species as one of the most conspicuous and beautifully colored trees in the autumn Japanese landscape where it becomes a stately tree of 30 feet tall. This species is apparently rare in this country, although at present, the Morton Arboretum reports growing it. China, Japan and Korea. Introduced in 1881. Zone (VI)

Related species: POISON SUMAC—*Rhus vernix*. This is a highly poison shrub native of northeastern and southern United States. Not cultivated.

12. POTANIN'S SUMAC — *Rhus Potaninii* (syn. *R. sinica*, *R. Henryi*). HARMLESS.

This species is rarely cultivated, although at present it is growing at the Arnold Arboretum. In its native habitat Potanin's sumac is described as a small tree, about 25 feet tall with divided leaves, each with 7-9 leaflets; the whitish flowers are produced in pendulous panicles as compared to most sumacs with upright flower panicles. One English writer highly recommends this sumac on account of the scarlet foliage in autumn. Central and western China. Cultivated in 1902. Zone (V). (Illus. F)

13. *RHUS PUNJABENSIS* var. *SINICA*.
HARMLESS.

I have been unable to determine whether *R. punjabensis* var. *sinica* is in cultivation at the present time in this country, although it should be completely hardy along the north Pacific coast. It is described as a small tree to nearly 35 feet tall closely related to Potanin's sumac. The species itself is native of the Himalaya mountains, whereas the variety is native of central and western China. Cultivated in 1890. Zone (V)

14. SMOOTH SUMAC — *Rhus glabra*.
HARMLESS.

Well grown, few species of the genus can surpass the smooth sumac. The graceful fern-like summer foliage white beneath, the blazing red leaves in autumn, and the distinctive fruiting heads with red berries are qualities that recommend the smooth sumac for ornamental planting. Even in the poorest soil this species will thrive admirably, and ultimately may reach 15 feet tall. Native over much of the United States. Cultivated in 1620. Zone (II). (Illus. M)

14a. *Rhus glabra* var. *laciniata*. A horticultural variant of the native species. The leaflets usually are twice dissected and of more ferny appearance than the species itself. Less hardy than the species. Cultivated in 1863. Zone (VI). (Illus. N)

15. STAGHORN SUMAC—*Rhus typhina*.
HARMLESS.

The staghorn sumac often reaches tree-like proportions up to 30 feet tall with smooth rich brown stems and trunks. The branches are extremely hairy giving the plant a somewhat felted texture. The bold fruiting heads with attractive red berries persist on forked branches well into winter, thus alluding to "staghorns." In other respects, the staghorn sumac closely resembles the smooth sumac, and for ornamental purposes the two species are of equal value. Native of north-central and northeastern United States. Cultivated in 1629. Zone (III)

15a. *Rhus typhina* var. *laciniata* and var.

dissecta both with leaves at least twice dissected. Horticultural variants of the species.

16. MICHAUX'S SUMAC—*Rhus Michauxii* (syn. *R. pumila*, *Schmaltzia Michauxii*).
POISONOUS?

Michaux's sumac is a highly ornamental dwarf species about 3 feet tall, reported as poisonous by some individuals and harmless by others. Native of a small area in North Carolina. It was grown in the Missouri Botanical Garden some years ago but is no longer present there. Cultivated in 1806. Zone (V)

Evergreen Leaved Sumacs

The evergreen species of California and the southwest form a distinctive group of native American sumacs. Unfortunately, they are less hardy than their northern deciduous relatives, although in the mildest districts along the Pacific coast of Washington and Oregon, especially near the coast, they should succeed with reasonable success. The cultural requirements would pre-suppose perfect drainage, heat, and little frost. They are non-poisonous.

17. LAUREL - SUMAC — *Rhus laurina* (syn. *Malosma laurina*).

The laurel-sumac is a shrub, 5-13 feet tall with oblong-ovate to lanceolate leaves 2-3 in. long and smooth edges. The branchlets are purplish. This is a handsome shrub with glossy, dark green foliage. Native of southern California and Baja California. Zone (VII). (Illus. H)

18. LEMONADE-BERRY—*Rhus integrifolia*.

The lemonade-berry is a handsome shrub or small tree, occasionally to 30 feet tall with thick leathery ovate leaves, $\frac{1}{2}$ -2 $\frac{1}{2}$ in. long with smooth or spiny edges. The branches are chocolate brown and clothed with dense gray pubescence. Native of southern California and Baja California. Zone (VII)

19. SUGAR-BUSH—*Rhus ovata*.

The sugar-bush and the lemonade-berry look much alike, but the leaves of the sugar-bush are larger and with longer petioles and the berries are smaller. This species occurs in

(Continued on Page Twenty-seven)

Injury to Trees and Shrubs in the State of Washington as a Result of Air Pollution

CHARLES GARDNER SHAW*

AIR pollution frequently causes severe injury to green plants. This type of injury most often is referred to as smoke injury. "Smoke" characteristically contains various gases together with immense numbers of minute particles of solid material. The reflection of light from this dust makes the smoke visible, but the dust itself causes relatively minor damage to green plants. Only under unusual circumstances do dust deposits on leaves become heavy enough to interfere with photosynthesis and transpiration.

The gases in the "smoke" are primarily responsible for injury to vegetation. In many instances injurious gases are liberated into the air without being accompanied by minute particles. In such cases they are either invisible or at most show only as an indistinct haze.

Sulphur dioxide, chlorine, fluorine¹ and illuminating gas have all been shown to be injurious to vegetation. These gases are liberated during various industrial processes, including those involved in smelting ores and the manufacture of paper pulp, aluminum, beryllium, copper, iron, ceramics, glass, brick, and fertilizers. Extremely small amounts of these gases in the atmosphere cause injury. In the case of sulphur dioxide, air analyses made in damaged areas reveal but a few parts per million. Fluorine is even more toxic; in areas where fluorine injury is severe often but a few parts per billion are present in the atmosphere.

Sulphur Dioxide

The injurious effects of sulphur dioxide (SO₂) have been fully investigated. One of the most significant of these investigations is that conducted by the National Research

Council of Canada in the Columbia River Basin. The toxic fumes in this instance originated from smelters located at Trail, B. C. Industries utilizing large quantities of coal, smelters which reduce ores containing sulphur, pulp mills, and certain other industrial plants frequently are responsible for the liberation of sulphur dioxide fumes.

Conifers are apparently more sensitive to sulphur dioxide injury than are broadleaved trees. This is believed due to the fact that most conifers normally retain their needles for three to six years, thus allowing cumulative absorption of the gases. On conifers SO₂ injury is usually expressed as a reddish discoloration. The entire needle may be affected, or the discoloration may be limited to an area at the base, the middle or the tip of the needle. When the injury is severe, defoliation occurs, and as a result it is frequently difficult to find needles that show typical symptoms.

On broadleaved trees areas of the leaf tissue lying between the larger veins usually become brown and later bleached. The foliage tends to curl at the margins and the discoloration gradually spreads until the leaves die and drop off.

The following lists indicate the relative susceptibility of various conifers, broadleaved trees, and shrubs grown in the Pacific Northwest. In each case the most sensitive species is listed first, the most resistant last.

Conifers: Larch, Douglas fir, ponderosa pine, Engelmann spruce, white pine, hemlock, lodgepole pine, silver fir, white fir, and red cedar. Larch, while extremely sensitive in the early part of the growing season, quickly becomes more resistant. If it escapes injury during the first month of the season's growth, it rarely shows symptoms.

Hardwood trees: Birch, aspen, apple, mountain maple, hawthorn, willow, cottonwood, mountain ash, locust, alder, chokecherry,

*Dr. Charles Gardner Shaw is associate plant pathologist at the State College of Washington, Pullman, and is an "expert" in diseases of trees and shrubs.

1. "Fluorine" is used in a loose sense in this paper. Fluorine is very reactive; undoubtedly it does not occur in the atmosphere as free fluorine, but rather as hydrogen fluoride or as other compounds of fluorine.

plum, pear, cherry, peach, apricot, elm, horse chestnut, silver maple.

Shrubs: Ninebark, ocean spray, serviceberry, mountain laurel, grape, raspberry, currant, mock orange, snowberry, elderberry, lilac, spiraea, dogwood, sumac.

Fluorine Injury

Although fluorine injury to vegetation has been recognized for many years, it has not become a serious problem until very recently. During the past ten years the Pacific Northwest, because of its vast hydroelectric potential, has become a major center of aluminum production in the United States. In the reduction of aluminum, tons of fluorine are produced. In the absence of absorption equipment, this fluorine is liberated into the atmosphere where it comes in contact with green plants. Much of the basic research on fluorine injury has been carried out at the Western Washington Agricultural Experiment Station, located in Puyallup, and the main Agricultural Experiment Station and the Division of Industrial Research of the State College of Washington at Pullman.

In western Washington injury has been observed on orchard trees such as prunes and apricots as well as on many other kinds of plants. In eastern Washington severe injury and widespread death has occurred on yellow pine (*Pinus ponderosa*). Injury has also been observed on other conifers. Larch again appears to be the most susceptible, closely followed by various species of pine, including white pine and lodgepole pine.

On broadleaved trees such as prunes and apricots, the injury is typically expressed as a marginal burning of the leaf tissues. On pine and larch fluorine causes a burning of the needles from the tip toward the base. Where exposure to several parts per billion of fluorine in the atmosphere occurs frequently, thousands of ponderosa pines have been killed. On conifers which retain their needles, fluorine injury is easily confused with winter damage and SO₂ injury. The pattern of the damage is a useful tool in distinguishing between winter injury and injury resulting from industrial air pollution. Air analyses not only serve to

distinguish between winter injury and injury resulting from air pollution, but also permit easy distinction between SO₂ injury and fluorine injury.

In the areas where injury to ponderosa pine, prune, and apricot is severe, most other conifers and broadleaved trees do not show typical symptoms.

Control of Industrial Air Pollution

Industrial air pollution can be controlled only by preventing the release of toxic materials into the atmosphere. This has been successfully undertaken in many industries where formerly the liberation of sulphur dioxide into the atmosphere resulted in great damage. Sulphur dioxide can be recovered and used in the manufacture of sulphuric acid, for which there is a ready market. Indeed, for some industries the recovery process itself has proven commercially profitable and in many areas where sulphur dioxide formerly caused considerable damage to both shade and ornamental trees injury is now very rare.

The only satisfactory method of eliminating fluorine injury is to prevent the liberation of the gas at its source. Many industrial plants have already installed devices to recover fluorine and prevent its escape. Most of these utilize a washing or scrubbing system in which the fluorine is absorbed in water.

Fuel Gas

Fuel gas manufactured from coal or coke frequently causes injury to shade trees. Injury may result either from accumulation of gas in the soil or as a result of gas having been liberated into the atmosphere. With higher concentrations the leaves typically become discolored and wilt. However, there is considerable variability in the symptoms, and gas injury can easily be confused with other types of injury. In some cases the leaves may drop while still green, or they may become reddish brown and die without falling. Aerial concentrations typically cause a brittleness of the wood. The cambium becomes dry and later the bark tissues turn brown and disintegrate.

Roots of trees are more sensitive than the aboveground parts. Tubercles are usually

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The Arboretum Bulletin

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To keep memberships in the Arboretum Foundation in good standing, dues should be paid during the month payable. Active memberships more than three months in arrears and previously established \$2 memberships more than thirty days in arrears will be dropped and THE BULLETIN will be discontinued.

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Notes and Comments

The "Arboretum News" of West Virginia University for May 1952 contained announcement of the appointment of Mr. William M. Leeson as Director from July 1 of the new Arboretum-Plantations, an area of approximately 400 acres now in the early stages of development.

We welcome this news, and hope for many opportunities of cooperation and exchange of information and plant material between this institution and ourselves in the future, despite the considerable difference in climate and vegetation. Mr. Leeson is a graduate of West Virginia University, having received his master's degree in botany in 1952.

1 1 1

Tours of the Arboretum this summer were as popular as ever. During the peak season, May and June, as many as two groups a day, sometimes three, took the interesting walk along the trails. A new regulation for Arboretum activities is thus necessitated during the busy summer months; April through July will be reserved for Arboretum tours, and lectures on the Arboretum will be given only in the months of September through March. It is wise to make your reservations for lectures as soon as possible.

1 1 1

"Gardening Illustrated" for July 1952 notes the gift to the National Trust of Great Britain of Dr. Wilfrid Fox's privately owned Arboretum known as "Winkfield".

The Winkfield Arboretum is especially well known for its collection of *Sorbus* species. Plants are growing in our Arboretum from seeds of "Winkfield" *Sorbus* sent us by Dr. Fox in November, 1950.

The Arboretum is located near Godalming, Surrey, England, and is well placed on a hillside affording additional attractions in the many fine views.

1 1 1

The Arboretum is still anxious to increase its collections of certain plants to brighten some areas after most of the rhododendrons

and azaleas are over. The number and variety of old fashioned types of roses could well be increased, since the space is available in the allotted area beside the Boulevard at Miller and Roanoke Streets; most of these shrubs flower in June.

In the area around the head of Rhododendron Glen, close to the Upper Road, we have been planting lilies of the more vigorous kinds for the past five years; most of them, especially the regal lily (*L. regale*), the hybrid *L. princeps*, Mr. Jan de Graaff's Olympic hybrids, *L. Davidi*, *L. Martagon* and *L. Henryi*, have grown and flowered well and are increasing. Now we would like to extend the collection and add *L. auratum*, *L. speciosum* in quantity and more of the newer hybrids.

Suitable kinds of daffodils for mass planting would also be most acceptable.

Perhaps some Garden Club or Unit would be interested in these projects and care to sponsor a planting; if so they should get in touch with Mr. Mulligan at the Arboretum.



Western Red Cedar

(Continued from Page Ten)

is not a true cedar. In fact, none of the true cedars (genus *Cedrus*) are native to North America, although three species—the deodar, the Lebanon, and the Atlas or Atlantic cedar—have been introduced and are widely used in landscape decoration in many parts of the country.

The western red cedar is native to a large part of the Pacific Northwest. It grows along the coast of southeastern Alaska, British Columbia, Washington, Oregon, and northern California as well as inland to northern Idaho, western Montana, and the interior mountains of British Columbia. Its principal associates are Douglas fir, western hemlock, and Sitka spruce but one may also find it as a companion to other species of trees common in the range of the western red cedar. Among these may be included the Pacific silver fir, grand fir, and Pacific yew.

Rhododendrons From Seed

(Continued from Page Fourteen)

Germination. Germination takes about a month at room temperatures and during this time the soil surface must *never* dry out. When seedlings appear the flat must be placed in a greenhouse, cold frame, or a well-lighted window; until germination a cozy spot by the basement furnace will do nicely. I have raised good seedlings on my office window sill with an east exposure. In a greenhouse or exposed frame or window the glass must be painted or partial shade provided.

A temperature of 70° F. or above seems to give best results, and the plants will thrive at 90° F. in a moist atmosphere if kept from direct sunlight.

Transplanting. Transplanting to larger flats provides more root space and helps to keep ahead of mosses and molds that tend to outgrow the tiny rhododendrons. A first transplanting when the second leaves appear is desirable, although the seedlings can wait longer if sowed sparingly. The second soil mixture is like the first with perhaps less sand, and I invariably include well rotted manure or a bit of acid fertilizer to boost growth. Transplanting does not seem to set the plants back if uniform warmth and humidity is maintained, but transplanting accompanied by a sudden change in environment often causes them to stand still a month or more.

A second transplanting will be required later in the summer. At this time most species will be a half inch high or so. For the first winter a greenhouse or cold frame has the advantage of extending the growing season to produce big enough plants for the nursery bed at the end of the second year.



PLEASE: Do not discard a copy of the BULLETIN. If you have no further use for yours, pass it along to a friend or return it to the Foundation. Return postage will be guaranteed.

BOOK REVIEWS

The Azalea Handbook, 1952. Compiled and published by the Editorial Board of the American Horticultural Society, 1600 Bladensburg Road, Washington 2, D. C. Price, bound in cloth and including mailing charges, \$2.60.

The new *Azalea Handbook*, published by the National Horticultural Society, has condensed a very large amount of information into a rather small book, surprisingly complete.

As the foreword notes, "It is written for gardeners, leaving out most of the technical data which can be obtained from other sources".

There are twelve chapter headings, including soils, propagating, hybridizing, etc., but chapter V, "Azaleas for the Garden", is of special interest, bringing the history of almost all the hybrids up to date.

Chapter VI, "Azaleas for Various Areas", is also very useful as it gives gardeners in different localities the opportunity to study reports on Azaleas that will do well for them.

All the other chapters contain useful information for serious gardeners and for them and also for beginners, this book is almost a necessity.

L. E. BRANDT



The Gardener's Trouble Shooter, by Victor H. Ries, 312 pages (Sheridan House, New York 52). Price \$3.50.

If you are new gardeners, as we are, you will heap blessings on the head of an author who gives you information on "The Effect of Soil on Your Plants, What Fertilizers Do, The Effect of Temperatures on Plants, and The Effect of Wind and Climate on Plants". These are the titles of the first few chapters in *The Gardener's Trouble Shooter*, written by Victor H. Ries who is an extension professor of Floriculture of The Ohio State University, and who has spent the last twenty-five years in lecturing and writing columns on gardening.

If you have a plant that is ailing, turn to the chapter entitled "Plants and Their Problems" and if your diagnosis is entomological you then search out that particular insect in another entitled "Meet the Pests Personally" where you will find a complete description and a panacea. And more than that, the book is spiced with cartoon illustrations which will enable you to smile through your tears.

MRS. PAGE BALLARD



Nuttall's Travels Into the Old Northwest, by Jeannette E. Graustein, Ph.D. Published as "Chronica Botanica", Vol. 14, Nos. 1/2, (1951). Price \$3.00. (Chronica Botanica Co., Waltham, Mass.)

Chronica Botanica, as described by its publishers, is "An International Collection of Studies in The Method and History of Biology and Agriculture". This 14th volume "is dedicated to the illustrious Founders and Leaders of the former Botanic Garden and The Gray Herbarium of Harvard University through its continuing history".

This particular number is devoted to a summary of the known facts, some of which have not heretofore been published, and accomplishments of Thomas Nuttall, early plant explorer and well known to all botanists and gardeners of the northwest. The outstanding interest of the number is of course Thomas Nuttall's never before published Diary, written in 1810, when young Nuttall set forth at the request of Benjamin Smith Barton to locate curious plants, report upon the topography of the country, its mineral wealth, rivers and their sources, obtain samples of earth for analysis, and last but not least provide a detailed report of Indian tribes, their habits and customs, and note what plants were used for medicinal purposes. Young Nuttall was admonished that "next to his personal safety, science and not mere convenience in traveling is the object of the journey".

The Diary written on the journey was located in the possession of Major W. F. Dixon-Nuttall of Huyton, Lancashire, England, who loaned not only the 1810 Diary but an undated journal of a walking tour through the Lake Country of England.

The 1810 Journal, according to Miss Graustein, who is Associate Professor, Department of Biological Sciences, University of Delaware, is a small 124-page note book, 6¼ by 3⅞ inches, which has a blue paper cover on which someone had written in a bold hand "Botanical Work by an unknown author with specimens". The specimens remaining are a very few shattered herbaceous fragments. The color of the ink varies through the diary, suggesting that Nuttall made a small quantity at a time; the writing becomes very faint and difficult to decipher towards the end. The pages are numbered at the top; two consecutive pages are numbered 23, but as number 35 is omitted the subsequent pagination is correct through page 114. At that point Nuttall came to a series of alternating written and blank pages, for he had already used some of the last pages for desultory notes. He continued his discussion on blank pages, numbering them 115 and 116 and then added other odd memoranda so that a confusion of interspersed numbered and unnumbered pages occurs at the end.

Miss Graustein goes on to explain that many problems have arisen in preparing the manuscript for publication. To avoid tampering with an old manuscript the faulty punctuation and misspelling of the original have been maintained and the footnotes and addenda were fitted into the body of the manuscript, "with the assurance of the last piece of a jigsaw puzzle".

Miss Graustein has done a sympathetic, scholarly and painstaking piece of work on the Diary. We are indebted to her for clearing up obscure periods in the life of Thomas Nuttall and adding yet more interest to the life and accomplishments of this outstanding figure. Of absorbing interest are the many illustrations in the book. They are well chosen, their reproduction well executed, making the volume a collector's item outside of its value to botany and to history.

MRS. E. B. HANLEY

Sumacs—Relatives of Poison Ivy

(Continued from Page Twenty-one)

Arizona, southern California and Baja California. Zone (VII). (Illus. L)

20. TEXAS EVERGREEN SUMAC—*Rhus virens* (syn. *R. sempervirens*).

This is an attractive evergreen shrub about 3-7 feet tall with shiny leathery, divided leaves. It should be tried along the northwest coast in mild districts. Native of southeastern New Mexico, Texas and northern Mexico. Zone (VII). (Illus. C)

Another sumac, *Rhus choriophylla*, closely related to *R. virens*, occurs in New Mexico and Arizona. Also, *Rhus microphylla*, with small 3-lobed leaves occurs from western Texas to southeastern Arizona and northern Mexico but is of little ornamental value.

Cultivation of Sumacs

The sumacs as a group are easily grown. Most kinds thrive in dry sterile soils where many plants fail; in fact, impoverished soil suits them well and increases the intensity of autumn coloration.

Many species grow readily from seed planted in autumn and left outdoors over winter.

Root cuttings may be taken and used to increase the stock of most species. These should be taken in late autumn and placed in pots in a good compost and left in the greenhouse until new growth has started. A cool basement would also satisfy this purpose. The fragrant sumac (*R. aromatica*) may be increased readily by layering or cuttings of the mature wood.

Several native American species spread by suckers, and, for this reason they should be planted judiciously in a location where suckering will be of little consequence. In this category are the smooth sumac (*R. glabra*), stag-horn sumac (*R. typhina*), shining sumac (*R. copallina*), and Texas sumac (*R. lanceolata*). Further objections to the sumacs as cultivated ornamentals can only be dictated by personal taste, or by the facilities available for growing these plants.

Sumacs for Beverage Purposes

The ripe berries of *Rhus typhina*, *R. glabra*, and *R. copallina* when bruised exude a highly flavored oil distinctly acid in taste and not unlike lemon juice with a hint of strawberry or cherry flavoring. In fact, these sumac berries are so lemon-like that it is possible to use them, as did the American Indians, to make a refreshing fruit drink which can barely be distinguished from genuine lemonade. But the berries must be fully ripe, in late August and September, in which stage they smell much like red-raspberry jam. The drink is easily prepared by filling a bowl of water with the individual hairy red berries. Do not crush the berries, but bruise them by rubbing; this releases the small amount of liquid held at the base of the red hairs and gives the flavor. Use only the red-fruited sumacs, not the white-berried kinds which include the poisonous species.

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The Brooklyn Botanic Garden

(Continued from Page Five)

Out-of-town visitors as well as New York City residents usually request directions for reaching the Garden. In brief: the Broadway-Seventh Avenue I.R.T. Subway line takes one to the "Eastern Parkway-Brooklyn Museum" Station, only a few steps from the Tuch Memorial Gate to the grounds. Riding time from Times Square, 25 to 30 minutes. The B.M.T. Brighton Express from Times Square requires 20 to 25 minutes; the "Prospect Park" Station is across the street from the Empire Boulevard entrance to the Botanic Garden. It might be well to point out here that the Garden is unrelated to Prospect Park, although they are adjacent to one another.

Mail should be addressed to 1000 Washington Avenue, Brooklyn 25, N. Y.

ARBORETUM NOTEBOOK

This department is published for correspondence and pertinent comments by experienced growers on interesting plants and their culture. We solicit your questions but space limitation necessitates the publishing of only such answers as we deem of general interest.

. . . Garden Notes and Hints . . .

SEPTEMBER

Penstemons are seldom seen in the average garden and there is much to be said for their masses of summer blooms in many choice colors and habits. In the rock gardens in Wisley and Edinburgh the low-growing varieties made great masses of pink, purple and white. They were also used at the front of the perennial borders. They seem indifferent to soil conditions. I found many varieties of our native Washington Penstemons here and there. *Penstemon* is a typical American genus but many fine hybrids have been developed. They grow easily from cuttings which may be taken in September.

This is a fine time to go over the rock garden, digging in good soil while the ground around plants is in workable condition.

Most seeds germinate more quickly if sown immediately after gathered. They may be sown in pots, and if no greenhouse is available the containers may be plunged to the rim in a cold frame. Some seeds germinate quickly and the seedlings should be separated into another pot or flat and treated the same as the original containers.

September is the month to prepare the pots for forcing bulbs. Until one has had a window garden of flowering bulbs in December or January it is hard to realize the pleasure they give. Those who have only grown daffodils and tulips should try a few pots of *Amaryllis* and early *Iris*. They bloom a little later but they are fool-proof and very rewarding.

OCTOBER

After seeing Lime trees (*Tilia*) all through France and England, I wonder we do not use them more. They are beautiful trees with smooth bark and light green leaves varying in size with the different species. The blossoms are charming, fragrant tassels of creamy-white flowers. Some gardeners may object to the soft yellow bracts that fall through the summer but many trees are somewhat messy with far less beauty than the Lime tree. It is eventually a large tree and this must be considered when planting in special places.

One of the greatest pleasures of a garden are the blooms of the winter-flowering *Crocus* appearing on every sunny or fairly sunny day during the winter. Try a few of the following, which will bloom from fall until early spring: *C. speciosus* and *C. zonatus* appear in the fall, *C. chrysanthus* and the beautiful *C. Imperati* continue until spring. There are several others. Try to give them a sheltered, open spot. Other than this they ask little cultural aid and they increase amazingly.

Mr. Bryan Taylor says the climbing roses (if they were not pruned in September) should be pruned now, selecting this season's growth to keep and train where needed. All other shoots should be cut back to base. After the first

frosts tall shoots of garden roses may be cut back to three feet, finishing the pruning in spring.

Seedling bulbs of lilies should not be left to be transplanted in spring. They start growth too early to handle in our wet soils. Of course all purchased bulbs should be planted immediately they are received from the dealers.

1 1 1

No sun—no moon!
No morn—no noon!
No dawn—no dusk—no proper time of day—
No warmth, no cheerfulness, no healthful ease,
No comfortable feel in any member—
No shade, no shine, no butterflies, no bees,
No fruits, no flowers, no leaves, no birds—
NOVEMBER. Thomas Hood.

1 1 1

I was particularly pleased when visiting gardens in England and Scotland to notice in what high favor they hold our wild currant (*Ribes sanguineum*). It was beautiful in the long paths of the Woodland Garden at Wisley and in many places it was used in the borders of fine shrubs. They have developed a form, *R. s. splendens*, which is more striking with a longer raceme of bloom and a deeper pink in color. To me it is no more beautiful than the ones that grow in our native woods.

1 1 1

Perhaps I have spoken of *Neillia* in these columns before but it was always one of the joys of my garden. *N. longiracemosa* has a graceful manner of growth, long arching wands with leaves reminding one, in shape and size, of its close relatives, the *Spiraeas*; deeply veined, and in the fall turning to red and bright bronzy-green, making it a fine foliage shrub for autumn. It blooms in early summer with long racemes of tubular, bright pink blossoms. In poor soil it is straggly, but in fairly moist, good soil it should hold its own in the special shrub border.

List of Plant Names

(Continued from Summer Issue)

Gramma-	Gr. gramma, a line and
tophyllum	phyllum, a leaf
grammopetalus	petals striped or marked
grandiceps	large headed
grandicuspis	with large points
grandidentatus	large toothed
grandiflorus	large flowered
grandifolius	large leaved
grandiformis	on a large scale
grandipunctatus	with large spots
grandis	large, big
graniticus	granite-loving
granulatus	covered with minute grains
granulosus	granulate
Gratiola	Lat. grace or favor
gratissimus	very pleasing
gratus	pleasing
graveolens	heavy-scented
Greigia	after Maj. Gen. Greig, Russian horticulturist

Grewia	after Nehemiah Grew of Coventry	Hedychium	Gr. sweet snow, from white, fragrant flowers
Greyia	after Sir George Grey, governor of Cape Colony	Hedysarum	Gr. for sweet smell
Grindelia	after H. Grindel of Riga	Hedyscepe	Gr. sweet covering
Griselinia	after Franc Grisellini, Venetian botanist	<i>hedythamnus</i>	sweet shrub
<i>griseus</i>	gray	Heimia	after Dr. Heim, Berlin
<i>groenlandicus</i>	of Greenland	Helenium	possibly for Helenus, son of Priam
<i>grosseserratus</i>	large-toothed	Heliamphora	Gr. compound meaning sun- pitcher
<i>gummifera</i>	gum-bearing	Helianthella	resembling Helianthus
Gunnera	after J. Ernst Gunner, Swedish botanist	Helianthemum	Gr. for sun-flower
<i>guttatus</i>	spotted, speckled	<i>helianthoides</i>	helianthus-like
Guzmania	after A. Guzmán, Spanish naturalist	Helianthus	Gr. helios, sun and anthos, flower
<i>gymnocarpus</i>	naked fruit	Helichrysum	Gr. for sun and gold
<i>gymnocaulon</i>	slender-stemmed	Helicodiceros	Gr. spirally 2-horned
<i>gymnocephalus</i>	slender-headed	Heliconia	after Mt. Helicon in Greece
<i>gymnanthum</i>	naked flowers	Heliocereus	sun and cereus
<i>gymnomiscum</i>	with a bare stalk	Heliotropium	turning to the sun
Gymnosporia	Gr. gymnos, naked and sporos, seed	Helipterum	Gr. for sun and wing
Gynerium	Gr. gune, woman, and erion, wool	Helleborus	ancient Gr. name
Gynura	name refers to tailed stigmas	Helonias	Gr. swamp
Gypsophila	gypsum-loving (calcareous soils)	<i>helveticus</i>	Swiss
<i>gyrans</i>	revolving in a circle, gyrating	<i>helvolus</i>	reddish yellow
Habenaria	Gr. strap, referring to shape of parts of flowers	Helwingia	after G. A. Helwing, German clergyman
Haberlea	after Karl C. Haberle, prof. of botany at Pesth	Helxine	Gr. to tear (seeds catch on clothes)
Hacquetia	after Balthasar Hacquet, au- thor of works on alpine	Hemerocallis	Gr. beautiful for a day
<i>hadriaticus</i>	Adriatic	Hemicyclia	Gr. semi-circular
Haemanthus	blood-flower	<i>hemidartum</i>	half flayed
haemastomus	red-mouthed	Hemigraphis	half written (obscure)
haematocalyx	blood-red calyx	Hemionitis	Gr. mule. Plants erroneously supposed to be sterile
haematocheilum	blood-red lips	<i>hemiphloeus</i>	half-barked
haematodes	bloody	<i>hemisphaericus</i>	hemi-spherical
Haematoxylum	Gr. for blood and wood	<i>hemitrichotum</i>	half hairy
<i>hainanense</i>	from Hainan	Hepatica	liver-like, from shape of leaves
Hakea	after Baron van Hake, German botanist	<i>hepaticaeifolius</i>	hepatica-leaved
<i>hakeoides</i>	Hakea-like	<i>heptamerum</i>	with seven parts
Halesia	after Stephen Hale, famous author	<i>heptaphyllus</i>	seven-leaved
<i>halimifolius</i>	Halimium-leaved	<i>heracleifolius</i>	heracleum-leaved
Halimodendron	Gr. maritime tree	Heracleum	dedicated to Hercules
halophilus	salt-loving	<i>herbaceus</i>	not woody, herb-like
Hamamelis	ancient Gr. name of a fruit	Herniaria	Gr. supposed to cure hernia
hamatus	hooked	Hesperaloe	Lat. western aloe
Hancockii	after W. Hancock	Hesperethusa	Lat. from one of the Hesperides
Hamelia	after Henry Louis Du Hamel de Monceau	Hesperis	Gr. evening
Hardenbergia	after Francisca, Countess of Hardenberg	<i>hesperium</i>	western
Harpephyllum	Gr. for sickle and leaf	Hesperoyucca	Lat. western yucca
Hartwegia	after Theodore Hartweg, collector in Mexico	<i>heteracanthus</i>	various-flowered
<i>hastatus</i>	hastate, spear-shaped	<i>heterocarpus</i>	various-fruited
<i>hastifera</i>	spear-loving	<i>heterodon</i>	various-toothed
<i>hastilis</i>	of a javelin or spear	<i>heteroglossus</i>	various-tongued
<i>hastulatus</i>	somewhat spear-shaped	<i>heterolepis</i>	variable-scaled
Haworthia	after A. H. Haworth, English botanist	<i>heteromorphus</i>	various in form
<i>hebecarpus</i>	pubescent-fruited	<i>heteropetalus</i>	various-petaled
Hebenstreitia	after J. E. Hebenstreit, Professor of medicine	<i>heterophyllus</i>	various-leaved
<i>hebephyllus</i>	pubescent-leaved	<i>heteropodus</i>	various-footed or stalked
Hedeoma	Gr. sweet smell	Heuchera	after Johann Heinrich von Heucher
Hedera	ancient Latin name for ivy	Hevea	Brazilian native name
<i>hederaceus</i>	of the ivy	<i>hexagonus</i>	six-angled
		<i>hexandrus</i>	with six stamens
		<i>hexapetalus</i>	six-petaled
		<i>hexaphyllus</i>	six-leaved
		<i>hians</i>	open, gaping
		Hibbertia	after George Hibbert
		<i>hibernalis</i>	pertaining to winter
		<i>hibernicus</i>	of Ireland
		<i>hibiscifolius</i>	hibiscus-leaved

Hibiscus	ancient Gr. name for marsh mallow
Hidalgoa	after Mexican naturalist, Hidalgo
Hieracium	Gr. a hawk
hierochunticus	of Jerico
himalaicus	Himalayan
himertum	lovely
Hippeastrum	knight, or horse, and star
Hippocrepis	Gr. for horse and shoe
Hippophae	ancient Gr. name of a spiny plant
hippophaeoides	resembling sea buckthorn
hircinus	with a goat's odor
hirsuticostatum	hairy ribbed
hirsutus	hirsute, hairy
hirtellus	somewhat hairy
hirtiflorus	hairy-flowered
hirtipes	hairy stalked or stemmed
hirtus	hairy
hispanicus	Spanish
hispidissimus	very bristly
hispidulus	somewhat bristly
hispidus	bristly
Hoffmannia	after Georg Franz Hoffmann, Prof. of Botany
Hoheria	a New Zealand (Maori) name
Holcus	Gr. for a kind of grass
hollandicus	of Holland
Holmskioldia	after Theodor Holmskiold, a Danish botanist
holocarpus	whole-fruited
holochrysus	wholly golden
Holodiscus	Gr. entire, and discus
holosericeus	woolly, silky
hcmolepis	similar scales
hongkongense	from Hong Kong
Hordeum	ancient Latin name for barley
horizontalis	horizontal
Horminum	old Gr. name for sage
hormophorum	bearing a necklace
horridus	prickly, horridly armed
hortensis	belonging to a garden

(To be continued)

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Injury to Trees and Shrubs in State of Washington as a Result of Air Pollution

(Continued from Page Twenty-three)

formed near the tips of the roots and the roots become contorted. There is a proliferation of tissue in the root lenticels resulting in pustules on the root surfaces. The interior of the roots so affected become brown.

Gas injury is most frequently associated with leaky mains. Often the odor of leaking gas is the most certain means of diagnosing the trouble. Frequently injury will occur along the path of a given main, symptoms often appearing on the nearby vegetation after repair work or a change in operating pressure.

Tomatoes are very sensitive to fuel gas, being injured by concentrations below those necessary to kill trees. Consequently they are often used as an indicator plant. Obviously this type of injury can most easily be prevented by eliminating leaks that occur in gas mains and during production.

Herbicides

Air pollution in the past has been associated with large cities and with industrial areas. Within recent years the extensive use of 2-4-D weed killer makes it necessary to recognize that air pollution may also originate in agricultural areas. Each year 2-4-D is being used more and more extensively in the control of broadleaved weeds, both in residential lawns and especially in agricultural crops such as wheat, oats, barley, rye, etc., and in roadside weed control programs. At the present time 2-4-D is undoubtedly responsible for

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more injury to vegetation than any other air pollutant. In the State of Washington spraying from aircraft in the grain growing areas has become a common practice. Extremely small volumes are used in aerial spraying, often but a gallon of material being used to cover an acre. Under such conditions the individual spray particles are extremely small and thus are very likely to remain in the air. Furthermore, ester formulations, which are much more volatile than is the amine salt, are commonly employed in aerial spraying. The extremely small particle size and the high volatility of the formulation used make it almost impossible to prevent extensive drift of the material even on very calm days. The ester is so volatile that even careful ground application does not prevent injury to other vegetation. After application volatilization of the compound continues and the vapors are carried to other plants.

Among common ornamental trees of this area, box elder, chinese elm, and black locust are very susceptible. Characteristically, the first leaves produced early in the growing season escape serious injury since they mature before extensive spraying with 2-4-D commences. Leaves produced later during the season are dwarfed, extremely contorted and chlorotic. On many trees a yellow green mottling of the leaves similar to that caused by some viruses is produced. The new shoots become extremely curved. Exposure to larger amounts of the chemical causes the leaves to die. During the past two years box elders and Chinese elms particularly have shown

extensive dieback of the twigs and small branches as a result of 2-4-D injury. Death of the twigs normally occurs in the year following that in which injury to the leaves occurs.

Most deciduous trees can suffer severe defoliation for two or three consecutive years before being killed as a result of such injury. Undoubtedly, however, continued use of 2-4-D on anything like the present scale will result in the death of many ornamental shade trees in the next few years. At the present time box elder, Chinese elm, and black locust cannot be recommended for planting as ornamental trees in areas where this herbicide is used extensively. Among the broadleaved trees the maples, including Norway maple, silver maple, and sycamore maple, basswood, ash, and Russian olive are somewhat tolerant to 2-4-D. Evergreens as a group are much less susceptible than are broadleaved trees to 2-4-D injury. Ornamental cedars particularly appear resistant. The pines appear to be the most susceptible of the evergreens, although by no means as subject to injury as are the more susceptible broadleaved trees. A slight deformity of the new shoots of Norway spruce has also been noted.

Injury to desirable trees, shrubs, and other plants can only be prevented by careful hand application of the amine salt. The use of the ester formulation cannot be recommended. Indeed in some states the use of 2-4-D in any form is prohibited.

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Larger Leaved Cotoneasters

(Continued from Page Eight)

an inch and a half long, and the branches are slender and arching. Bright *red* berries.

PARNEYI (of the trade): Lovely bronze-tinged foliage, drooping branches, bright *red* berries.

PANNOSA: Resembles *C. Franchetii* in its grey-green leaves, elegant habit; has *dark red* berries.

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RHYTIDOPHYLLA: From China. Very distinct type resembling *Henryana*—long dark green leaves, with beautiful *pale salmon* or *coral* berries.

SALICIFOLIA: Leaves to an inch and a half long. Very useful evergreen, *bright red* berries.

SIMONSII: Very popular in the trade. Much used as hedge material; leaves up to one inch long when well grown in good soil, bears prolific *red* fruit. Deciduous.

TOMENTOSA: Shrub to six feet; leaves long and tomentose. Berries *brick red*.

WARDII: Beautiful shrub with leaves silver beneath. Handsome *orange* berries.

WATERERI: Large shrub to fifteen feet. Distinctive lance-shaped leaves and clusters of large *bright red* berries.

ZABELI (similar to the graceful *C. Dielsiana*): Long arching branches, leaves inch and a half long, and handsome *dark red* berries.

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Rhododendrons

(Continued from Page Fifteen)

clear lavender is blue to a Rhododendron fan) that I will probably keep 20 poor ones in memoriam. Personally I think the four-star rating should go to the grower, not the Rhododendron.

Then there is *intricatum*. Described as a delicate twiggy plant. Twiggy is right—mostly twigs. Or *hippophaeoides*, which I cherish for the name. Mine got tired of competing with colorful primulas so I moved it to a quiet woodsy corner where the only competition was some weatherbeaten salal. At least one can't call *R. neriiflorum* colorless. Such a magnificent red! But it would be nice if its blooms were as large as—no, we promised not to talk of hybrids.

By the way I just got from England some seed of *R. bullatum*. The Rhododendron Handbook describes it as having "large fragrant blossoms". Doesn't that sound perfect? "Inclined to legginess". Well, judicious pruning can cure that. "Hardiness rating D". I

know just the spot protected by the house and sheltered by a dogwood to provide filtered summer shade. Come out and see it in ten years!

The appointment of Dr. Henry T. Skinner to succeed B. Y. Morrison, who recently retired as Director of the National Arboretum, Washington, D. C., has been announced. Dr. Skinner has been curator of the Morris Arboretum, Philadelphia, Pennsylvania, for the past twelve years.

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Summer in the Arboretum

(Continued from Page Two)

Exchanges and Distribution

Various surplus seeds of value elsewhere were sent to the Missouri Botanical Garden, St. Louis, and to the Saratoga Horticultural Foundation and the Los Angeles State and County Arboretum in California. Buds of *Magnolia Kobus* var. *borealis* went to the Arnold Arboretum at Boston in exchange for a new hybrid of the same species, and a small collection of rose species in pots to the Seattle Park Department for their rose garden.

Staff

Seven members of the staff have been on vacations at intervals throughout this period, so that we have not had a full working crew for two months since mid June, when our principal truck driver left us for several weeks for an operation. Otherwise no changes have to be recorded.

Miscellaneous

The Seattle Rhododendron Society, a chap-

ter of the American Rhododendron Society, held their first show in the Arboretum clubhouse May 30-31.

The second TV program dealing with the Arboretum and the Foundation was produced by station KING on July 3, the theme being the Arboretum in summer. Examples of roses, *Cistus*, *Magnolia macrophylla* and other plants in flower were shown and described as well as the work and aims of the Foundation. Mrs. G. H. Johnston, Mrs. S. S. Sayers, Mr. Edward Rosling, Mr. John Hauberg, Jr., and Mr. B. O. Mulligan took part.

Nine members of the Raines Unit of the West Seattle Garden Club did an excellent day's work weeding in Woodland Garden on June 18, while on August 9 members of Unit 16 spent a day weeding in Loderi Valley.

More damage to plants has occurred this summer than for some years past. Two young *Magnolia* trees 7-9 feet tall were cut back to about 3 feet, and branches broken off our largest specimens of *M. macrophylla* and *M. Sieboldii* when in bloom in June. The bark was stripped off a 15-year-old Japanese cherry tree on Azalea Way for a length of about 5 feet. None of the perpetrators of this vandalism has been seen or caught in the act.

Mr. R. J. Hansen has drawn a new, up-to-date plan showing all plantings in the *Leguminosae-Cistaceae* area on the east side of the Upper Road north of Rhododendron Glen.

A revised general information leaflet of the Arboretum, with map, has been published for the use of visitors, and can be obtained without charge from the office (FRanklin 0990).

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Mr. Marten, of the University's Still Photography Unit, has continued to make pictures of plants and scenes for us as required; 64 have been taken in color for slides, 45 in monotone for illustrations or records.

In June we had 15 arranged tours for visiting garden clubs or other groups from Seattle or the surrounding areas. Three hundred and sixty visitors from many states have recorded their names in our visitors' book since June 1, including Minnesota, Nebraska, Ohio, Maryland, Arkansas, Louisiana, Iowa, many from California, and two each from Alaska and New Zealand.

Telephone inquiries for information since that date have numbered 171, a slight increase over the same period of last year.

Weather and Flowering

May was exceptionally dry, and the driest since 1928; only 0.35 inches were recorded in the city instead of the normal 1.87 inches. At the Arboretum we received 0.59 inches. At that season of growth rain is most essential to plants, and although in June the amount went up to 1.97 inches in the city, and 2.43 inches in the Arboretum (normal 1.33 inches), it is very probable that the lack of rain in May was responsible both for a shorter flowering season at that time and also for the fact that we had to begin watering by June 9. The first flowering here occurred on both *Magnolia acuminata*, the cucumber tree, and *M. Fraseri*, native from Virginia to Georgia in the mountains; these came to us from the Arnold Arboretum in 1940 but were not planted per-

manently until spring 1947. Many of the new Glenn Dale Azaleas, received in 1949-50, also flowered this year for the first time.

June, although wetter, was also cooler than usual, and in fact the coldest since 1930. Flowering of such plants as *Cistus*, roses (both species and old-fashioned types), *Magnolia macrophylla*, *Azalea occidentalis*, and the tulip trees was certainly extended by these conditions and the *Cistus* were especially profuse and beautiful.

July, and August up to the middle of the month at least, have both been extremely dry and often very warm; .55 inches of rain fell on July 22 in the Arboretum but no other record from July 1 through August 16. The temperature rose to 90 degrees or more on eight days in those seven weeks, and to 80 degrees or over on twelve other days, so that the need for very thorough and regular sprinkling throughout all the planted areas of the Arboretum has been continuous and demanding on those responsible.

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1 1 1

In Praise of Dwarf Cotoneasters

(Continued from Page Six)

leaves of yellow green turn to orange and red early but do not fall until very late in the autumn, so that only a short interval elapses before the new leaves clothe the stems again.

These and other low growing cotoneasters have contributed greatly to the solution of steep bank and rock garden problems and are in all likelihood going to hold their position of favor for all time.

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